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Factors Predicting Turnover of International Science and Engineering Faculty at US Research Universities

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To the Graduate Council:

I am submitting herewith a dissertation written by Lauren Longino Jacobs entitled "Factors Predicting Turnover of International Science and Engineering Faculty at US Research Universities." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Higher Education Administration.

Terry T. Ishitani, Major Professor

We have read this dissertation and recommend its acceptance:

Jimmy G. Cheek, Norma T. Mertz, Gretchen Neisler

Accepted for the Council:

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Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

**Factors Predicting Turnover of International
Science and Engineering Faculty at US Research Universities**

A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Lauren Longino Jacobs
December 2020

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ABSTRACT

In today's global knowledge-economy, US research universities seek to attract and retain the best and brightest faculty in the world to increase the university's intellectual capital and compete on a global scale. Increasingly, universities hire talented international faculty to fulfill these needs, which is especially prevalent in the science and engineering fields (S&E). International faculty benefit US universities in areas of research and scholarship as well as increased diversity and internationalization of the campus, however, not all international S&E faculty are retained. In fact, higher turnover has been found among international S&E faculty than their domestic peers (Kim, Twombly, & Wolf-Wendel, 2012), which results in high financial costs of replacement and disruptions to research projects and education programs. To decrease these costs and continue to compete on a global scale, US research universities must seek to retain talented international faculty at their institutions.

The purpose of this study was to gain a better understanding of international S&E faculty who leave US institutions for another job and their career path after departure. Results of this research may inform programs and practices which seek to retain international faculty in S&E departments at US research universities. This study utilized a large, national dataset from the National Center for Science and Engineering Statistics, National Science Foundation and provided results through descriptive statistics summaries and binary logistic regression analyses. The dependent variable studied was job departure between February 2015 and February 2017. Independent variables were

categorized as perceived desirability of movement factors, perceived ease of movement factors, and institutional factors.

This study's descriptive statistics summaries showed a higher percentage of female faculty than previous studies and a lower departure rate than previously reported. Most international faculty who leave their job remain in the US, however, almost a third leave higher education. Among predictors of international S&E faculty turnover, perceived desirability of movement and perceived ease of movement factors were both found to be significant, yet institutional factors were not significant. Perceived ease of movement factors, specifically employment factors within this category, had the greatest explanatory power of the decision to leave.

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CHAPTER I.

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

In an effort to increase intellectual capital, universities spend valuable resources on the recruitment and retention of high-quality faculty from around the world (Marginson, 2006). For many top-tier research universities in the US, this has led to an increase in recent decades of the number of international faculty employed in science and engineering (S&E) as universities compete with both developed and developing nations for the brightest academic minds to contribute to fundamental research (JASON, 2019). The first major influx of international faculty immigrating to the US took place in the 1990's, which can be largely attributed to changes in US immigration laws for highly skilled individuals (Johnson, 2000; Lowell, 2001; Watts, 2001). During this time, the number of foreign-born, full-time faculty in the US grew from 28,200 in 1969 to 74,200 in 1998 (Schuster & Finkelstein, 2006). In the twenty-first century, foreign-born faculty continued to increase as a percent of all faculty from 15.4% in 2000 to 22.1% in 2003 (Lin, Pearce, & Wang, 2008). More recently, the Institute of International Education (2019b) reported that the total number of international scholars working in teaching or research positions at US universities reached 136,563 in the 2018/2019 academic year.

Of all international faculty working in the US, over 60% are employed in science and engineering (S&E) fields (National Center for Education Statistics [NCES], 2004). Not only are international faculty highly concentrated in S&E, but foreign-born S&E faculty make up 28% of all full-time faculty in those fields (National Science Board [NSB], 2018). In addition, enrollment of temporary visa holders, which indicates international student status, continue to increase in S&E doctoral programs. Since doctoral programs serve as a funnel to faculty

appointments, it is likely that the percentage of international faculty in S&E will continue to grow with the increase in supply of international S&E doctorates coming to study at US institutions and remaining in the US for employment (Finn & Pennington, 2018; Kim, Bankart, & Isdell, 2011).

US institutions benefit from employment of international faculty in S&E in numerous ways, both related to campus environment and research. International faculty can contribute to the diversity of faculty at an institution and increase multiculturalism of the campus (Foote, 2013; Theobald, 2013). In the classroom, international faculty are able to draw upon their diverse background to offer different viewpoints and challenge assumptions held by students (Lin et al., 2009; Skachkova, 2007). Teaching styles may even be different, as many international faculty draw upon multiple pedagogical styles. As US institutions seek to internationalize their campuses and prepare students for a global workforce, exposure to different ways of thinking is becoming an increasingly important component of the educational experience. In addition, international faculty contribute to racial diversity at institutions of higher education with over half of international faculty identifying as a minority (Lin et al., 2009).

International faculty also play an important role in research at the university. International faculty contribute significantly to university research agendas with many studies having found that compared to their US peers, international faculty are more productive researchers (Corley & Sabharwal, 2007; Kim et al., 2011; Levin & Stephan, 1999; Mamiseishvili, 2010; Mamiseishvili & Rosser, 2010; Webber, 2012; Webber & Yang, 2014). In fact, the benefit of productive research activity extends beyond the international faculty themselves, with the presence of international colleagues positively affecting the research productivity of US faculty at the same institution (Kim et al., 2011). Depending on the amount

of time international faculty spent in their home country, they may also have extensive professional social capital in other countries that can assist in joint research projects (Berzins, 2017).

Despite the benefits of international faculty presence at US institutions, not all international faculty are retained. Kim, Twombly, & Wolf-Wendel (2012) found that a significantly lower percentage of noncitizen faculty planned to remain at the same institution compared to citizen faculty. Of S&E faculty, 18% of international faculty left their positions at US institutions compared to the 16% leave rate of US-born faculty. The departure of faculty can create significant educational and financial costs for the institution, which is particularly true for Science, Technology, Engineering, and Math (STEM) fields where universities invest start-up funds ranging on average from \$390,000 to \$490,000 for an assistant professor and \$700,000 to \$1.44 million for senior level faculty (Ehrenberg, Rizzo, & Condie, 2003). The departure of faculty also results in discontinuity in research projects and educational programs led by individual faculty, all of which can take up to ten years for an institution to recoup the loss (Kaminski & Geisler, 2012). Therefore, as international faculty make up a significant portion of faculty in S&E, it is important to retain these individuals to decrease costs to the university. However, a limited number of studies have examined international S&E faculty who leave their position at a US institution.

Of studies focused on international faculty, several have pointed to the importance of tenure status on the decision to leave an institution. In general, faculty in pre-tenure status are more likely to leave than tenured faculty (Zhou & Volkwein, 2004), which is especially prevalent in STEM where half of faculty leave the institution within eleven years of appointment (Kaminski & Geisler, 2012). This trend is seen even more strongly among international faculty.

For example, non-US citizen pre-tenure faculty are more likely to intend to leave an institution than US citizen pre-tenure faculty (Kim et al., 2012). However, even reaching tenure status involves risk of departure. Although Kaminski and Geisler (2012) found in their study of US and international faculty that post-tenure faculty are less likely to depart than pre-tenure faculty, Kim et al. (2011) found that international faculty were less certain of their future plans and more likely than US faculty to depart after reaching tenure status.

Studies have also shown that for faculty as a whole, satisfaction is positively related to staying at the institution and the same has been found true for international faculty (Kim, Wolf-Wendel, & Twombly, 2013). However, international faculty report lower satisfaction due to difficulties in relating to colleagues (Kim et al., 2012), workplace discrimination (Manrique & Manrique, 1999), exclusion from local research networks (Berzins, 2017), limited leadership opportunities (Skachkova, 2007), lack of autonomy (Wells, Seifert, Park, & Umbach, 2007), and poor departmental fit (Kim et al., 2013).

The large proportion of international faculty in S&E, higher departure rate, high costs of faculty turnover, and limited research studies on the population demonstrated the importance of further investigation.

Statement of the Problem

In the global knowledge-economy, US universities seek to hire and retain high quality faculty in S&E, many of whom are international. In 2018, foreign-born faculty made up 28% of full-time faculty in S&E fields employed at US universities (NSB, 2018). These faculty benefit US campuses through high research productivity and increased diversity of faculty who then, in turn, teach and mentor students. However, not all S&E international faculty choose to remain at their institution, with Kim et al. (2012) finding that international faculty are more likely to depart

from their institution than their US peers. Turnover of these international faculty are costly for their departments, and if the individual chooses to leave the US, also results in a loss to the US S&E industry. As the majority of US basic research is conducted at universities, international faculty who leave their position for non-higher education sector positions also represent a loss in this essential form of research which contributes to broadly shared scientific research (Stephan, 2012). Although studies regarding retention of US faculty are plentiful, considerably few studies focus on international faculty in S&E. While we know some things about international faculty who leave their institution, we do not know the characteristics of their post-departure job or what factors are associated with the decision to leave. Therefore, this study sought to gain a better understanding of international S&E faculty who leave their position at US universities.

Purpose of the Study

The purpose of this study was to gain a better understanding of international S&E faculty who leave US institutions for another position and their career path after departure.

Research Questions

Specifically, this study addressed the following research questions:

- RQ1. What are the descriptive statistics of international S&E faculty employed at US research universities?
- RQ2. Of international S&E faculty who leave their job, what are the characteristics of their next position?
- RQ3. What perceived desirability of movement factors (i.e. job satisfaction) predict international S&E faculty's decision to leave their job?
- RQ4. What perceived ease of movement factors (i.e. gender, race, marital status, having children, birth region, citizenship, age, faculty rank, tenure, job field, job benefits,

- employment length, government supported work, professional organizations) predict international S&E faculty's decision to leave their job?
- RQ5. What institutional factors (i.e. institutional control, Carnegie classification, region) predict international S&E faculty's decision to leave their job?
- RQ6. How do perceived desirability of movement, perceived ease of movement, and institutional factors influence international S&E faculty's decision to leave their job?

Summary of Methods and Procedures

To answer the research questions listed in the previous section, this study examined data collected by the National Center for Science and Engineering Statistics (NCSES), National Science Foundation (NSF)¹ from international faculty in S&E who responded to two surveys: the Survey of Earned Doctorates and the Survey of Doctorate Recipients. The study was limited to R1 and R2 research universities since typical work activities and emphasis placed on these activities can vary across institutional type. In addition, non-citizen faculty have been found to be most likely concentrated in high research and very-high research universities (Kim et al., 2013). Limiting the study to one classification of university assisted in maintaining homogeneity of the sample and capturing the typical work environment of most international faculty.

International status was determined by a combination of birth location and citizenship status, while faculty status was limited to those working in faculty roles in a full-time capacity.

The selection of independent variables of this study was influenced by March and Simon's (1958) theory of organizational equilibrium. This theory describes employment of individuals as their decision to participate in the organization and frames voluntary turnover as influenced by two factors: the perceived desirability of movement and the perceived ease of movement. When both the perceived desirability of movement and the perceived ease of

movement are high, the individual will leave the organization. When both perceived desirability of movement and perceived ease of movement are low, the individual will stay at the organization. Perceived desirability of movement factors in this study included satisfaction with the overall job, salary, benefits, job security, job location, opportunities for advancement, intellectual challenge, level of responsibility, degree of independence, and contribution to society. Perceived ease of movement factors included personal factors (i.e. gender, race, marital status, having children, birth region, citizenship, and age), employment factors (i.e. faculty rank, tenure, job field, job benefits, employment length), and organizational visibility factors (i.e. government supported work, professional organizations). In addition, Carnegie classification, institutional control (public vs. private), and region were used as institutional factors.

The research questions were answered using descriptive statistics summary and binary logistic regression analysis. RQ1 and RQ2 were answered through descriptive statistics summary including results in frequencies and percentages. The remaining four research questions were answered through binary logistic regression analysis with whether or not the international S&E left their job as the dependent variable. Categories of independent variables were added in stages with a final model including all factors in the analysis such that RQ3 included only desirability of movement factors, RQ4 included only ease of movement factors, RQ5 included only institutional factors, and RQ6 included all factors.

Significance of the Study

The study is significant in that it contributes to the limited literature on international faculty departures, specifically international faculty in S&E fields. While a few studies have examined factors associated with international faculty who leave, up until now these studies have only been able to track the career path after departure for those who stay in the US. This study

will include the next position for all international faculty who leave, regardless of where the position is located in the world, and examine additional variables that could potentially be associated with the decision to leave. The inclusion of international faculty who leave the US is significant in that it provides information on the competitiveness of US institutions in retaining international faculty. If the US hopes to remain highly regarded in global higher education, highly skilled international faculty need to be retained at US institutions.

Limitations and Delimitations

One delimitation of this study was the sample. By choosing data from the NCSES surveys, the sample was limited to only international S&E faculty who graduated with their doctorate from a US institution. While these graduates are included in S&E faculty, they constitute only a portion of all international faculty employed by at US research universities. There are also many international faculty educated outside the US who choose to work in US universities. These non-US educated individuals may perceive additional barriers to success in the workplace that is not captured through this study, however, the benefits of the richness of data provided through the NCSES outweighed the drawbacks of the limited sample selection.

One limitation of the study was how international was defined. Across the literature international has been defined in various ways, with no consistent definition. With the available variables, this study defined being born outside the US and not a native US citizen as international in an effort to conceptualize international with an emphasis on cultural differences one may experience by growing up in a different country. While it is common for studies to use birth country to define international, citizenship status was added to aid in removing individuals who were born to US parents living abroad. This study sought to conceptualize international as someone who felt the cultural differences of their home culture and US culture, however, there

may be individuals included in this sample who have spent a significant portion of their lives in the US.

While using a large dataset provided a diverse and relatively large sample, several limitations stemmed from the use of this dataset. First, this study was limited in the selection of independent variables since the data was already collected and the researcher could not design an instrument to gather all the variables desired. Furthermore, this limited the ability to consider what factors may be pulling individuals to leave their job. We do not know what offers of employment individuals may or may not have received from other institutions nor do we know what familial, societal, or cultural pulls may impact the decision to leave. This study focused on the factors which may push an individual to leave, rather than the pull factors.

Additionally, this study used data collected at two specific points in time, February 2015 and February 2017, which may not match the departure rate at other times. It is difficult to compare the job departure rate found in this study to others since variation in the time studied would impact the results. For example, expanding this study to examine turnover in a four year time period would have increased the percentage of international S&E faculty who left their job. It is also important to consider how the political context of the 2015 to 2017 time period may have impacted international S&E faculty turnover. In late 2016, Donald Trump, who was well known for his strong rhetoric on limiting immigration to the US, was elected US President (Winders, 2016). It is likely that this election caused uncertainty among international faculty, particularly those who were non-US citizens, which may have influenced their decision to leave the US.

Another limitation arose which related to the protection of privacy of individuals in the sample. While the sample was large (N=1,730), only approximately 6% of faculty left their job

(N=105). This limited the types of descriptive statistics which could be produced for those who left since a group of less than five would not maintain the privacy of the individuals. Some statistics were not reported or categories were collapsed into more broadly defined categories to maintain privacy

A final limitation of this study was the quantitative nature of the analysis. While quantitative studies can find statistical connections between variables, they do not provide depth of response and an understanding of why the outcomes are found. A qualitative or mixed-methods study on this topic might uncover a deeper understanding of why international S&E faculty choose to leave their job.

Definitions

Science and Engineering (S&E) – life sciences (biological, agricultural, and environmental), computer and information sciences, mathematics and statistics, physical sciences (geosciences, atmospheric, and ocean), social sciences, engineering

International faculty – faculty who were born outside the US and upon completion of his or her US doctorate degree were not a US citizen as indicated in the Survey of Earned Doctorates

Organization of the Study

This study is organized into five chapters. Chapter 1 included an introduction to the topic, the problem and purpose of this study, the research questions, a summary of the methods and procedures and the significance of this study, as well as limitations and key definitions. In chapter 2, the theoretical framework and literature relevant to the study is reviewed. Chapter 3 details the data, procedures, variables, and analyses used in this study. Chapter 4 describes the findings of the study and addresses the study research questions. Chapter 5 contains a summary of the findings and a discussion of how these findings may impact higher education as well as recommendations for future research.

CHAPTER II.

REVIEW OF THE LITERATURE

Introduction

The purpose of this study was to gain a better understanding of international S&E faculty who leave US institutions for another position and their career path after departure. This chapter presents a critical review of the literature related to this topic in four sections. The first section offers a historical review of the growth of S&E in the US, the role of research in this industry, and the researchers who carry out this research. In the second section, the research and literature related to the growth of international faculty in S&E is reviewed. The third section describes the theoretical framework used to frame this study. The final section concludes with a review of the literature related to domestic and international faculty turnover.

Growth of S&E in the US

The modern view of S&E and the importance of research in these fields to the US can be traced back to World War II. At this time, the importance of scientific research to support the national defense was vital to the war effort and resulted in increased federal funding for research and development (National Academies of Sciences, Engineering, and Medicine [NASEM], 1993). Advances in technology demonstrated the power of fundamental research and gave people in the US an appreciation for the advantages of technological advances. Eager to maintain the competitive advantage in economic growth and national defense, the US began a new era of federal funding for S&E research following the conclusion of World War II.

The new focus on S&E was made evident in the seminal report *Science, the Endless Frontier*, which highlighted the importance of fundamental research to the national welfare (Bush, 1945). Traditionally, funding for basic research originated from private donors; however,

the expanded importance of S&E research meant that this method of funding was no longer sufficient (NASEM, 1993). Only the federal government had the funding to support the quickly growing industry of S&E basic research, an expansion that quickly led to useful developments such as the polio vaccine and transistor-powered electronics.

From the 1950's to the Cold War era, S&E research continued in importance to the US largely due to the military advantage of new technologies with the additional benefit to the public through innovation and economic growth (NASEM, 1993). After the collapse of the Soviet Union, motivation for the US's interest in S&E research shifted primarily to economic growth. As one of the world's most prosperous economies, the US government has been eager to maintain this position of power which has resulted in S&E emphasis through today.

S&E Research Funding

Scientific research is conducted in three areas of the economy – industry, academia, and governmental or non-profit research labs (Stephan & Ehrenberg, 2007). In 2017, the US spent approximately \$118 billion dollars on research and development, of which approximately 28% took place at universities, 35% in industry, 11% in governmental and non-profit research labs, and 26% towards intramural R&D programs and general administrative costs (NSF, 2018b). Although the percentage of funding at universities is lower than in industry, it should be noted that universities account for approximately 57% (\$19 billion) of all basic research conducted in the US, while industry accounts for only 8% of basic research.

Basic research, or research designed to further fundamental understanding, is an important factor in economic growth due to its potential for multiple uses and ease of sharing results (Stephan, 2012). However, industry is not incentivized to participate in basic research since the central purpose of sharing information with others would result in the individual

company losing any competitive advantage from the knowledge acquired. In addition, basic research experiences a long time-lag from discovery to application, which can disincentivize companies from investing in this type of research. To create incentives for basic research, the US federal government provides funding through grants and contracts. The majority of federal funding comes from four agencies: the National Institute of Health (NIH), the National Science Foundation (NSF), the Department of Defense (DOD), the Department of Energy (DOE). Basic research funded through these grants and contracts do not block researchers from sharing results and can even incentivize the individual researcher to publish materials so that they may claim priority of discovery amongst their peers. However, funding is only one input for S&E research. The personnel to carry out research projects is also an important consideration in S&E research at universities.

S&E Researchers

Universities must employ highly trained individuals so that they may carry out research in S&E. S&E research is conducted at universities by full-time employees in the academic workforce (i.e. professors, postdoctorates, research associates) and part-time graduate or undergraduate assistants. In 2015, academic employment of doctorate holders in S&E reached just under 400,000 with approximately 64,000 educated outside the US (NSB, 2018). Of the remaining 329,000 US-educated, almost one-third (97,000) were foreign-born. This results in a significant portion, approximately 41%, of the S&E academic workforce in the US consisting of foreign-born or foreign-educated individuals. In addition, foreign-born faculty make up 28% of all full-time faculty in S&E (NSB, 2018).

Growth of International Faculty in S&E

While the proportion of international faculty in S&E is currently large, international faculty were not always as prevalent in these fields in the US. In 1979, foreign-born faculty made up only 11.7% of all S&E faculty in the US (Stephan, 2012). Due to growth in US doctorate education and changes in immigration regulations, international S&E faculty as a percentage of all S&E faculty grew to 16.3% in 1997 and then to 21.8% in 2006. This section will begin with a demographic description of international S&E faculty then examine the factors contributing to the fast growth of those faculty in US institutions.

Demographics

It is important to understand who international faculty in S&E are; however, it is difficult to determine since limited information is available. Often cited in international faculty research, the Institute of International Education (IIE) provides some of the most comprehensive data on international scholars through their annual Open Doors Report on International Educational Exchange. However, the IIE defines this group in more narrow terms to only include “scholars on non-immigrant visas engaged in temporary academic activities and not enrolled as a student at a U.S. college or university” (IIE, 2019a, para. 1). This results in counting only temporary lecturers, researchers, and other academic positions rather than the more permanent positions which full-time faculty often hold. In addition, the data are not disaggregated by position, which would allow more accurate information on only those engaged in faculty positions. Despite these drawbacks, data from the Open Doors Report are often cited by scholars studying international faculty. However, a few studies examining international faculty in S&E can provide more accurate information about this specific population (Corley & Sabharwal, 2007; Webber, 2013; Sabharwal, 2008; Stephan, 2012).

Gender. Data are limited and inconsistent in reporting the gender makeup of international faculty in S&E. On the lower end, Webber (2013) used the 2004 National Study of Postsecondary Faculty and found that females constituted 14.6% of foreign-born S&E faculty. Conversely, two other studies using the Survey of Earned Doctorates data found that females represented slightly more than 20% of S&E foreign-born faculty in earlier years (Corley & Sabharwal, 2007; Sabharwal, 2008).

Country of origin. Country of origin data of international S&E faculty is only available from Sabharwal's (2008) study on foreign-born faculty using the 2003 Survey of Doctorate Recipients. The 10 most prevalent countries of birth for foreign-born faculty in the study were China (21.6%), India (14.6%), Taiwan (5.8), Iran (3.4%), Canada (2.9%), Germany (2.3%), England (2.2%), Greece (1.8%), Hong Kong (1.8%), and Korea (1.8%). The majority of foreign-born faculty were from Asia (63.5%) with approximately 20% from Europe and slightly above 5% from Africa.

Disciplinary field. Not all disciplines within S&E employ significant portions of international faculty. Using the 2006 Survey of Earned Doctorates data, Stephan (2012) determined that the disciplines with the highest percentages of foreign-born faculty out of all faculty within that discipline were engineering with 34.9% foreign-born faculty, math/computer science with 31.4% foreign-born faculty, and physics and astronomy with 23.3% foreign-born faculty. Conversely, chemistry and biological sciences had the lowest percentages of foreign-born faculty with 14.6% and 15.2%, respectively.

Another way of viewing the discipline breakdown is to examine the most common disciplines at which foreign-born faculty work. Webber (2013) found that of foreign-born faculty in the study, the majority were concentrated in engineering/engineering technologies

(26%) and biological/biomedical sciences (21.6%) and least concentrated in agriculture/natural resources (2.6%). The differences from these two studies' data on biological sciences can appear contradictory at first, however, it should be noted that the biological sciences experienced a surge in funding doubling the NIH budget from 1998 to 2003 making larger lab groups possible (Gerbi & Garrison, 2007).

Faculty status. As in previous demographic categories, faculty rank and tenure status data are limited for S&E international faculty. Webber's (2013) study of only tenure and tenure-track faculty found that slightly more than two-thirds of foreign-born S&E faculty were tenured. The study also described rank of faculty in the sample with almost 40% full professors and the remaining 60% evenly split between associate professors and assistant professors. Sabharwal's (2008) study that included all full-time, foreign-born S&E faculty found that almost half were tenured with approximately 22% on tenure-track but not tenured, 12% not on tenure-track, and 17% for which tenure was not applicable. The same study also described the academic rank of the sample: 32.1% full professor, 25.1% associate professor, 33% assistant professor, 3.3% instructor or lecturer, and 15.6% other position. From these two studies, it can be concluded that many international S&E faculty hold tenure or tenure-track positions.

Factors Affecting Growth

While there are many reasons that an individual faculty member may choose to work in the US, three key factors eased or encouraged the growth of international faculty in S&E: increases in enrollment of international students in US doctorate programs, increases in the stay rate of graduates of doctorate programs, and changes to immigration laws which has created more opportunities for immigration to the US for highly-skilled individuals.

Doctorate education. The large percentage of international academic workers is not surprising given demographic changes in graduates of S&E doctoral programs in the US and the fact that over half of all international S&E faculty in the US receive their doctorate degree in the US (NSB, 2018). Since 1970 the percentage of international doctorates in S&E has been constantly growing, except for a period of reported decline in the late 1990's, which can be partially attributed to an unwillingness of individuals to declare their citizenship status, and another period of decline in 2008 resulting from visa restrictions enacted after 9/11 (Stephan, 2012). The most rapid growth was during the period from 1981 to 1999, in which PhD programs in S&E at US universities grew by 61.7% with graduates in temporary visa status accounting for more than 50% of the growth (Black & Stephan, 2007). Although the annual growth of temporary residents in S&E has slowed in recent years, temporary residents still make up a significant portion of S&E graduates with 34% of all S&E graduates in 2017 holding temporary visa status (NSF, 2018a).

The growth of enrollment of international students in doctorate programs resulted from trends both within the US and outside the US (Stephan, 2012). For US students, a doctorate degree in S&E became less desirable over time due to the relatively low wages compared to other occupations, the length of time to complete the degree, and stagnant wages for faculty. Conversely, countries outside the US, such as China, South Korea, and India, experienced growth in bachelor-degree holders who were then able to apply for doctorate programs in the US. International students were more willing to accept graduate student stipends and were less selective than US students in choosing doctorate programs. Therefore, when research labs gained funding for projects, they drew upon the widely available market of international students.

Stay rate. After receiving a US doctorate degree in S&E, students have the option of remaining in the US for short-term, or in some cases long-term, employment. Since these employment options can include faculty, it is important to review the growth in stay rate of international doctorates. Arguably the most thorough studies of the topic have been completed by Finn (2000, 2001, 2007, 2010, 2012, 2014) and Finn and Pennington (2018) through a series of reports utilizing administrative data from the Social Security Administration in conjunction with results of the Survey of Earned Doctorates and the Survey of Doctorate Recipients. In his first analysis, Finn (2000) discovered that with the substantial increase in the number of S&E doctorate degrees awarded to non-US citizens prior to the 1990s and the increased stay rate of S&E international graduates (four-year stay rate of 53%), the total number of international S&E doctorates staying in the US increased dramatically in the early 1990s. This trend continued in the later part of the decade with 51% of international S&E doctorates graduating in 1995 having stayed in the US four years later and 63% of those graduating in 1997 having stayed in the US two years later (Finn, 2001). The two-year stay rate first peaked in 2001 and 2003 with 68% of international S&E doctorates remaining in the US. However, soon the two-year stay rate began to decline with 64% of international S&E doctorates staying in the US in 2005 (Finn, 2007). In Finn's (2010) report on 2007 graduates, the two-year stay rate rebounded to 67%, but the five-year stay rate at 62% was lower than previously observed. The five-year stay rate continued to decrease in 2009, however, the ten-year stay rate reached a new high at that time (Finn, 2012). Starting with the 2012 report, Finn began to average the five-year stay rate and ten-year stay rate to view the overall trend in international S&E doctorates staying in the US. The average calculated stay-rate in 2009 was 62% and continued to increase steadily through 2011 and 2013 data (Finn, 2012; Finn, 2014; Finn & Pennington, 2018).

Other studies have also examined the stay rate of S&E international doctorates. Han, Stocking, Gebbie, & Appelbaum (2015) surveyed 166 international S&E graduate students at the University of California and found that 78% hoped to remain in the US upon graduation. In addition, Roh (2015) concluded that the one-year stay rate for international S&E doctorates had the lowest rate in 2003 at 77%, peaked in 2007 at 84%, and then began to decline with an 81% stay-rate in 2010.

Immigration laws. One contributor to the growth of international S&E faculty in the US has been changes to immigration laws, which have created more paths for faculty to receive authorization to work in US academic institutions either through Optional Practical Training (OPT) or an H-1B nonimmigrant visa.

The most common immigration status for degree-seeking international students in the US is F-1 visa status. Upon graduation, international students in the US on F-1 visas are eligible to apply for OPT. If granted, OPT provides work authorization for recent graduates in the short-term to gain practical experience related to their degree (US Citizenship and Immigration Services [USCIS], 2019b). OPT has been available for international students in various forms since the Immigration and Nationality Act of 1952; however, it was not until 1977 that the maximum work period was reduced from 18 months to one year (McFadden & Seedorff, 2017). In 2008, the Department of Homeland Security announced a new 17-month OPT extension for students graduating in STEM fields (Extending Period of Optional Practical Training, 2008). In 2016, the STEM OPT extension was increased to 24 months resulting in a total of 36 months of authorized employment (Improving & Expanding Training Opportunities, 2016). Since many faculty positions in S&E require recent doctorates to first gain experience in postdoctoral

research positions, it is common for international graduates from US universities to use OPT for employment as postdoctoral researchers.

The most common method of obtaining work authorization for international faculty is through an H-1B nonimmigrant visa. This visa was created in its first form, the H-1 visa, by the passage of the Immigration and Nationality Act of 1952 which allowed aliens of exceptional merit and ability to work in the US on a temporary basis (US Citizenship and Immigration Services [USCIS], 2019a). There was no limit on the number of H-1 visas, therefore international faculty coming to work in the US were not deterred by limited options for work authorization. It was not until the Immigration Act of 1990 that significant changes were made to the H-1 visa (Leiden & Neal, 1990). The H-1 was replaced with H-1A visa for nurses and H-1B visa for workers in specialty occupations, such as international faculty, with at least a bachelor's degree or comparable experience. Most impactful, a quota of 65,000 was established for H-1B visas in each fiscal year and employers were required to pay the H-1B employee wages that met requirements set forth by the Department of Labor and US Citizenship and Immigration Services. Quotas were temporarily raised to 115,000 through the 1998 American Competitiveness and Workforce Improvement Act and then the American Competitiveness in the 21st Century Act of 2000 exempted universities, government research labs, and certain nonprofits from H-1B quotas (Stephan, 2012). This exemption has undoubtedly been a major factor in the growth of international faculty in the US.

Theoretical Framework

This study utilizes March and Simon's (1958) theory of organizational equilibrium, a widely used theory influencing faculty turnover studies (Kim et al, 2013; Lawrence, Celis, Kim, Lipson, & Tong, 2013; Matier, 1990; Zhou & Volkwein, 2004), to guide the design of the study

and frame the issue of employee voluntary turnover. Building upon initial observations by Barnard (1938) and Simon (1947), March and Simon (1958) described the theory of organizational equilibrium in their seminal work *Organizations*. Essentially, the theory focuses on the decision to participate in the organization by identifying major participants, such as employees, and describing the factors affecting their decision to participate, or work, in the organization. In this theory, participants in an organization can include employees, clients, investors, and other stakeholders in the organization. The present study, however, focused on organizational equilibrium as it relates to employees of the organization. The central components of the theory are that 1) an organization consists of participants interrelated through social behaviors, 2) participants receive inducements from the organizations in exchange for their contributions, 3) participants will continue their participation in an organization so long as the inducements are equal or greater than the participant's contributions, 4) organizations manufacture inducements from the contributions of participants, and 5) the organization is solvent and will continue to exist only as long as contributions are large enough to produce the needed inducements. Contributions from participants in the organization are responsible for creating the inducements offered to participants.

It is important to distinguish the differences between the key concepts of inducements and contributions from their utilities, or derived satisfaction. For employees, inducements can be in the form of wages, benefits, or other payments made by the organization. Inducements for the individual participant are measurable and separate from the utility value derived from these inducements. Contributions are payments made by the individual to the organization, such as time and energy to complete work for the organization. Again, the individual contributions are measurable and separate from the utility derived from these contributions. The utility of a

contribution is defined as the value of the alternatives that an individual foregoes so that they can make the contribution.

To achieve organizational equilibrium, there must be a balance between inducement and contribution utilities and observing this balance can be difficult. The most logical measurement of the inducement-contribution utility balance would be related to the job satisfaction of the individual, as it would be assumed the greater the difference between inducements and contributions, the greater the job satisfaction. However, a zero-point on the job satisfaction scale and on the inducement-contribution utility scale are not equal. For job satisfaction, reaching zero is the point where satisfaction turns to dissatisfaction and the individual would begin searching for alternate employment options. On the inducement-contribution utility scale, zero represents the point at which the individual is indifferent to leaving the organization. For these two points, the differences in the meaning of zero is dependent upon how alternatives to the current activity are entered into the scheme. Dissatisfied individuals will begin searching for alternate employment and if no better option is found, they will gradually readjust their aspiration level. On the other hand, the inducement-contribution utility adjusts quickly to a lack of better employment options by decreasing the utility of contributions, or activities foregone. Consequently, to accurately measure inducement-contribution utility, ease of movement must be taken into consideration along with job satisfaction. This leads to the central components of the theory of organizational equilibrium as it relates to voluntary turnover: 1) perceived desirability of movement and 2) perceived ease of movement. When both perceived desirability of movement and perceived ease of movement are high, the individual will decide to leave, while the low perceived desirability of movement and perceived ease of movement leads the individual to stay.

The perceived desirability of movement is affected by two major factors: satisfaction with the job and the perceived possibility of intraorganizational transfer (March & Simon, 1958). The greater the employee's satisfaction with the job as defined by him, the less perceived desirability of movement. March and Simon acknowledge that a wide range of job-related factors can affect job satisfaction, however, this theory focuses on the psychological mechanisms that lead to job satisfaction defining three major propositions. First, the "greater the conformity of the job characteristics to the self-characterization held by the individual, the higher the level of satisfaction" (p. 94). The greater the difference between the ego-deal and reality the more pronounced the desire to leave the position. Second, the "greater the predictability of instrumental relationships on the job, the higher the level of satisfaction" (p. 94). For example, an employee who can predict the amount of individual resources, such as time or energy, needed to achieve a certain result will be more satisfied. Third, the "greater the compatibility of work requirements with the requirements of other rolls, the higher the level of satisfaction" (p. 95). Membership in groups, both work and non-work related, have requirements of the members. Employees who find it easier to balance the needs of various groups will be more satisfied with their job.

In organizational equilibrium, perceived desirability of movement is also affected by the possibility of intraorganizational transfer. For larger organizations, the workers will perceive more opportunity for changes in position by changing departments, due to the sheer size of the organization and number of opportunities. March and Simon (1958) state that moving a worker to a new department within the same organization does not constitute as leaving the organization. The "larger the organization, the greater the perceived possibility of intraorganizational transfer, and therefore, the less the perceived desirability of leaving the organization" (p. 99)

The perceived ease of movement is affected by the number of extraorganizational alternatives perceived by the individual, which consists of three key factors: the level of business activity, the number of organizations visible, and the personal characteristics of the participants. March and Simon (1958) acknowledge that the state of the economy is the main influence on turnover, however, this theory offers refinements of the propositions. First, the “lower the level of business activity, the less the number of extraorganizational alternatives” (p. 100). In other words, when specific industries see growth there will be more job opportunities, while an industry that experiences a slowdown will have less job opportunity. Second, the “larger the number of organizations visible to the participant, the greater the number of perceived extraorganizational alternatives” (p. 103). The number of organizations visible is affected by visibility of the individual and vice versa. Organizations which are larger, hold more prestige, include more individuals with high status, employ more individuals, or grow quickly are all more visible to the individual. At the same time, the visibility of the individual will affect the visibility of the organization since organizations may make themselves known to individuals with a wider range of personal contacts from memberships in organizations, higher social status, or more unique qualities. The number of organizations visible is also affected by the individual’s propensity to search. This search activity can be spurred on by job dissatisfaction or avoided by increased length of service with the organization or increased age of the individual. Third, the personal characteristics of the participants affects the number of extraorganizational alternatives perceived. March and Simon (1958) specifically mention that being female, older, non-White, or working for the organization longer will lessen the number of perceived extraorganizational alternatives for the individual.

March and Simon's (1958) theory of organizational equilibrium has been a commonly used foundation for studies on voluntary turnover among faculty (Matier, 1990; Zhou & Volkwein, 2004) and those specifically focused on international faculty (Kim et al., 2013; Lawrence et al., 2013). Thus, this theory assisted in framing the research questions and provided guidance for the selection of variables included as possible factors contributing to S&E international faculty turnover. Variables in this study are categorized into those contributing to perceived desirability of movement and perceived ease of movement. However, not all factors of March and Simon's theory were included due to limitations in the available dataset or uniformity of the sample. For example, level of business activity was not included since all individuals in this study participated in the same, highly specialized industry, therefore the level of business activity were assumed to be similar across universities.

Faculty Turnover

Since turnover among faculty is costly for the department and university at which the faculty works, many studies have examined the faculty's decision to leave their job (Bruce, 2011; Kaminski and Geisler, 2012; Kim et al., 2012; Kim et al., 2013; Lawrence et al., 2014; Matier, 1990; Park, 2015; Smart, 1990; Xu, 2008; Zhou & Volkwein, 2004). This section will begin with a brief review of important faculty turnover studies that did not disaggregate results by US and non-US faculty. Since international faculty are not the majority at most US universities, these studies likely highlight results related to American faculty rather than international faculty. However, as international faculty are included in this group, it provides an important start for the literature review. The second portion of this section provides a more in-depth review of the literature focused specifically on international faculty turnover, although

there are relatively few studies on this topic. Reviewing this literature will expose gaps in existing knowledge that this study addresses.

US Faculty Turnover

Matier (1990) examined factors that influenced the decision of faculty with outside offers of employment to leave their current position. To study this decision, Matier created a framework which drew heavily on research from March and Simon (1958) and Flowers and Hughes (1973), and consisted of three main elements in the decision to stay or leave a position including personal factors or “ease of movement”, push factors, and pull factors or “perceived desirability of moving” (p. 41). Ease of movement consisted of demographic information, visibility of the individual to the academic community, and the individual’s inclination to seek out a new position. Push factors, or the perceived desirability of moving, consisted of internal and external environmental factors. Tangible (e.g. salary, work rules, fringe benefits) and intangible (e.g. autonomy, sense of belonging, influence) factors made up internal environmental factors. External environmental factors were defined as non-work-related benefits such as family, friendships, and quality of life. Only when individuals possessed ease of movement and perceive internal and external environmental factors were favorable to move would they be expected to depart from their position. Matier distributed a survey to 239 tenure-stream faculty of all disciplines at two universities with firm opportunities to leave their respective university and conducted follow-up interviews with more than half of the sample. Findings showed that the intangible benefits associated with the work environment were more important to faculty tangible benefits. In addition, internal push factors such as limited career advancement opportunities and poor rapport with department leaders influenced the decision to leave more

than external pull factors so that even lavish external pulls were typically not sufficient to encourage movement without a strong internal push as well.

Also interested in studying the turnover of faculty and comparing the differences in the decision process for tenured and nontenured faculty, Smart (1990) developed and tested a causal model of faculty intentions to leave their current institution. He used intention to leave since previous studies had shown intention to leave as the best predictor of actual employee turnover. Smart obtained data from a national survey conducted by the Carnegie Foundation for the Advancement of Teaching and, in the final sample, included 2,648 faculty who were employed full-time and held a doctorate. Independent variables were categorized as exogenous, work environment, and job satisfaction with the dependent variable as intention to leave the institution. He used ordinary least squares regression to determine the direct effects of the casual factors on the dependent variable and indirect effects were calculated and tested for statistical significance. The analysis showed that regardless of tenure status, faculty who were younger, worked at institutions which had experienced decline and had a more autocratic form of governance, and reported lower levels of satisfaction with their career and organization were more likely to intend to leave their institution. Specific only to tenured faculty, being male, spending more time on research, and higher publishing output were associated with intention to leave. Conversely, salary was the one unique factor which influenced nontenured faculty's decision to leave.

Drawing upon Matier's (1990) and Smart's (1990) models of faculty turnover, Zhou and Volkwein (2004) conducted a study of predictors of intended departure with a focus on differences in predictors by tenured versus non-tenured full-time faculty. The study used data from the 1999 National Study of Postsecondary Faculty, which included both institutional and individual-level responses. Combining both internal and external factors, the authors employed

structural equation modeling to develop separate models of faculty intention to depart for tenured and non-tenured faculty, which was possible due to the robust large sample size. Results showed that several factors were important to both tenured and non-tenured faculty: seniority, compensation, doctoral degree, academic rank, minority status, compensation satisfaction, job security satisfaction, and external extrinsic reward. Most important among these variables were seniority, rank, and compensation as individuals with more seniority were less likely to depart. For tenured faculty, satisfaction with compensation was more important than satisfaction with job security, although the opposite proved true for non-tenured faculty. For both groups, satisfaction with resources increased the likelihood of staying, while institution decline increased intention to depart. Decline in the quality of research and undergraduate education, perceived unwelcoming environment for free expression of ideas, and seeing full-time faculty replaced with part-time faculty all led to a higher likelihood of leaving. Academic rank impacted the two faculty groups differently resulting in higher rank increasing departure intentions for non-tenured faculty and decreasing departure intentions for tenured faculty. For both tenured and non-tenured faculty, minority status increased the individual's likelihood of departing. Female faculty were more likely to leave, but this effect was very weak for non-tenured faculty. Among work experience variables, workload had the strongest impact on tenured faculty's departure intentions while non-tenured faculty with higher teaching productivity and more involvement in funded research were more likely to stay. The authors found it surprising, however, that family SES, marital status, institutional practices to consolidate instruction, and employee benefits did not influence faculty departure intention. Although this study is one of the more thorough studies on faculty departure, only intentions of departure were analyzed rather than actual

departure. However, the number of variables included in the study still provides valuable information regarding faculty departure intentions.

Bruce's (2011) study examined intention to leave and job satisfaction for pre-tenured faculty with a focus on differences by race and ethnicity. Data were drawn from the 2003-2005 results of the Collaborative on Academic Career in Higher Education (COACHE) survey developed and administered by the Harvard Graduate School of Education. Based on previous research, Bruce assumed that a relationship existed between job satisfaction and intention to leave, which was proven true in this study. Pre-tenure faculty who were less satisfied with expectations of their job had higher departure intentions. The study also showed that even after controlling for work-life job satisfaction variables, race and ethnicity significantly influenced intention to depart, with faculty of color being more likely to intend to leave their institution than their White (non-Hispanic) peers. However, Asian Americans and Hispanic/Latinos had intentions to depart that were relatively the same as their White peers. Job satisfaction was also examined by race and ethnicity. The study indicated that pre-tenure Asian American, African American/Black, and Hispanic/Latino faculty were less satisfied than White (non-Hispanic) pre-tenure faculty. As in Zhou and Volkwein's (2004) study, the limitation of Bruce's (2011) study is that departure intent is used as a proxy for actual departure. This is especially limiting in this study since Bruce mentions that faculty of color were more likely to not have thought ahead about whether they intend to leave or not, therefore this data may be especially inaccurate for the specific population studied.

Xu's (2008) study narrowed the focus of faculty turnover intentions to tenured and tenure-track women in STEM at research and doctoral universities. Using data from the 1999 National Study of Postsecondary Faculty, the author completed statistical analysis in two phases

employing MANOVA and regression models. The independent variables for the regression models were entered in five sequential blocks: demographics, professional factors, workload and productivity, satisfaction with work related variables, and satisfaction with structural factors of the institution. Results indicated there was no correlation between family responsibility (measured by marriage status and number of dependents) and intention to leave for either male or female faculty. In addition, women were not more likely to intend to leave their job than men; however, women had stronger intentions to change positions within academia than men. Both genders' intentions were influenced by perception of academic work and institutional culture, but only women were influenced by insufficient research support, advancement opportunities, and free expression of ideas. Since this study's data are from a national dataset, the author was limited in the available variables. Adding in variables that represented external pull factors would have increased the reliability of this study.

Kaminski and Geisler (2012) studied the retention rate of male and female faculty in STEM fields by determining actual departure from publicly available college catalogs and bulletins. Although this was a labor-intensive method of gathering data, it provided insights into actual departure that was missing in the literature previously. The authors' study included 2,966 S&E faculty from 14 universities who began at their university as assistant professors between 1990 and 2002, with follow-up data tracked through 2009. The Kaplan-Meier survival curve showed the largest declines at years 5, 8, and 10 with half of all faculty departing by 10.9 years. No significant differences were found between males and females in departure rate, however, the authors note that other studies have found that women were less satisfied with their jobs than men, yet their dissatisfaction did not appear to affect departure rate. Differences in departure rate were found by discipline with mechanical engineering faculty leaving later than other

disciplines. In mathematics, faculty were found to leave earlier than other disciplines and women were significantly more likely to depart earlier than men (4.45 years and 7.33 years, respectively). In addition, the survival curve showed that very few of these women persisted to 20 years.

International Faculty Turnover

Kim et al. (2013) examined faculty intention to leave, with particular emphasis on understanding the unique role of citizenship status while also considering background characteristics, institutional variables, and workplace satisfaction. The study drew upon Matier's (1990) model, which is rooted in organizational equilibrium theory, to define independent push/pull variables as individual, career-related, and institutional. Data studied included COACHE survey data from 7,315 tenure track faculty respondents at 4-year colleges and universities, of which 23% of respondents were non-US citizen faculty. Due to the categorical nature of the dependent variable (leavers, stayers, and undecideds), the authors employed discriminant function analysis to determine which variables discriminate between the three groups of faculty intentions. Citizenship status and race were found to matter in discriminating between leavers and undecideds, but not in discriminating between leavers and stayers. For both US citizens and non-US citizens, workplace satisfaction was found to discriminate between stayers and leavers, however, satisfaction with research and clarity of the tenure process mattered only to non-US citizens.

Park (2015) studied short-term and long-term turnover intentions of both international and US faculty at one large, public, Southeastern research university. To gather data, Park created and distributed an electronic survey to faculty at the university being studied (N = 970). Data were analyzed using eight ordinary least square (OLS) regression analysis with turnover as

the dependent variable. Findings of the study showed that distributive justice, or the perceived fairness of rewards relative to effort and experience, had the strongest negative effect on short-term turnover while communication openness, or degree to which information is communicated throughout the organization, had the strongest negative effect on long-term turnover. The study also compared differences in the level of influence of internal and external factors that affected faculty departure by international status. Findings suggested that the internal factors of autonomy, communication openness, and procedural justice were most influential in the intention to depart for international faculty, while external variables of kinship ties and job opportunity were most influential for US faculty.

Focusing on a specific group of international faculty, Lawrence et al. (2014) investigated the intent to continue employment at Carnegie Research Universities – very high research activity for Asian international faculty in STEM fields who held tenure track appointment, but were presently untenured. They conducted multinomial regression analysis on data collected between 2005 and 2009 by the Collaborate on Academic Careers in Higher Education (COACHE) at Harvard Graduate School of Education to identify variables that pushed or pulled uncertain faculty. Results indicated that faculty who were unsatisfied with the fairness of the tenure review process were more likely to intend to leave, while faculty satisfied with the amount of time for research and a strong sense of attachment to the campus were more likely to intend to stay.

In another article, Kim et al. (2012) analyzed international faculty turnover through two data sets. First, using the COACHE data Kim et al. (2012) examined faculty intention to leave and its relationship with job satisfaction and perception of department and institution fit. Differences were found by international status of faculty. Only 78.8% of noncitizen faculty

planned to remain at the same institution after gaining tenure status, compared to 83.1% of US citizen faculty who planned to remain. In addition, a higher percentage of noncitizen faculty compared to US citizen faculty planned to leave within five years after achieving tenure to work at another academic institution. The authors found that noncitizen faculty were significantly less satisfied with their interactions with colleagues and posited that international faculty are more likely to leave due to difficulties they experience with other colleagues in their department or at their institution.

In the same article, Kim et al. (2012) utilized longitudinal data from the Survey of Doctorate Recipients, a follow-up survey of international doctorate graduates from US universities, to determine actual mobility patterns of international faculty within academia and the nonacademic sector. This is the only study that includes actual departure of international faculty rather than intentions. The authors found that of the total sample of foreign-born tenure-track faculty, 18% did not remain at the same institution between 2001 and 2003. Of those who departed, 45% moved to another US higher education institution and 55% moved to the nonacademic sector. While foreign-born and US-born faculty were found to have similar stay rates (82% and 84%, respectively), foreign-born faculty who left their institution were significantly more likely to leave academia entirely. While this second analysis by Kim et al. (2012) does provide an overview of international faculty mobility, the data do not include those international faculty who departed the US. At the time of the study, the 2003 Survey of Doctorate Recipients did not include faculty who departed the US; however, starting in 2010 the survey has been administered to those outside the US as well as those within the US (NSF, 2019a). The present study will include these previously excluded respondents to provide a more complete picture of international faculty mobility.

Summary

As this review has shown, international faculty have become an important component of US higher education, particularly in S&E fields. As the US has continued its emphasis on S&E research, the number of international faculty have grown and now constitute a significant portion of S&E faculty at US research universities which is also where the majority of basic research takes place. Keeping these highly skilled individuals is important to the US higher education system as well as the US economy. While the issue of faculty turnover has been thoroughly examined, few studies focus specifically on international faculty turnover, and those who do are limited in scope. This study adds to the existing literature on international faculty turnover in S&E by using a large dataset to examine the factors that predict international faculty's decision to leave their job at US research universities. In addition, this study looked not only at the decision to leave, but also at the career trajectory of the faculty after departure, including even those who exit the US.

CHAPTER III.

RESEARCH METHODOLOGY

Introduction

The purpose of this study was to gain a better understanding of international S&E faculty who leave their job at a US research university and their career path after departure. Six research questions guided this study:

- RQ1. What are the descriptive statistics of international S&E faculty employed at US research universities?
- RQ2. Of international S&E faculty who leave their job, what are the characteristics of their next position?
- RQ3. What perceived desirability of movement factors (i.e. job satisfaction) predict international S&E faculty's decision to leave their job?
- RQ4. What perceived ease of movement factors (i.e. gender, race, marital status, having children, birth region, citizenship, age, faculty rank, tenure, job field, job benefits, employment length, government supported work, professional organizations) predict international S&E faculty's decision to leave their job?
- RQ5. What institutional factors (i.e. institutional control, Carnegie classification, region) predict international S&E faculty's decision to leave their job?
- RQ6. How do perceived desirability of movement, perceived ease of movement, and institutional factors influence international S&E faculty's decision to leave their job?

This chapter describes the methods and procedures used to conduct the study including a detailed description of source of data, study sample, research variables included in the study, and analytical methods.

Source of Data

This quantitative study answered the research questions described previously through the secondary analysis of data from the National Center for Science and Engineering Statistics (NCSES), Division of the National Science Foundation (NSF) collected through two survey instruments: the Survey of Earned Doctorates and the Survey of Doctorate Recipients.

The National Center for Science and Engineering Statistics (NCSES)

The establishment of the NCSES can be traced back to the formation of the NSF. After World War II, the US began to place greater emphasis on science and engineering which led President Truman to sign the NSF into law in 1950 (NASEM, 2018). After positive reception of an early report by the NSF on human resources for science and engineering, President Eisenhower issued an executive order in 1952 to establish the Division of Science Resources Statistics (DSRS) within the NSF to continue the collection of data and compiling of reports. The DSRS carried out this role until the division was renamed the National Center for Science and Engineering Statistics (NCSES) by Section 505 of the America COMPETES Reauthorization Act of 2010.

The mission of the NCSES, NSF is to collect and share data related to STEM education and US competitiveness, which it accomplishes through collection of statistical data on “research and development, the science and engineering workforce, US competitiveness in science, engineering, technology, and R&D, and the condition and progress of STEM education in the US” (NSF, 2019a). For this study, data from two NCSES, NSF survey instruments were used: the Survey of Earned Doctorates (SED) and the Survey of Doctorate Recipients (SDR).

The Survey of Earned Doctorates (SED) is an annual census conducted by the NCSES, NSF of all individuals receiving a research doctorate from a US university in an academic year.

The survey includes questions related to educational history, demographic information, and postgraduation plans of these doctorates (NSF, 2019c). The NCSES, NSF defines a research doctorate as a doctoral degree that requires the completion of a dissertation or comparable form of original intellectual contribution and is not primarily for practice of a profession such as MD, DDS, DVM, JD, DPhar, DMin, or PsyD. Survey data are available starting in the 1957-58 academic year, however changes to the survey over time may result in some missing variables in older records. When possible, newly recoded variables are created by the NCSES, NSF to provide consistency across survey cycles. The 42-item survey is completed through a self-administered web survey, a self-administered paper questionnaire, or computer-assisted telephone interviewing (CATI). The majority of participants respond through the web survey. Individual institutions are responsible for assisting in administering the SED or reporting institutional data for the small percentage of individuals who do not complete the SED. This study will utilize data from the 1958 to 2014 cycles. In the most recent of those cycles, responses included 54,070 people at 426 institutions (NSF, 2015).

The Survey of Doctorate Recipients (SDR) is a longitudinal survey administered on a biennial basis by the NCSES, NSF to a sample of respondents from the SED who received a doctoral degree from a US university in science, engineering, or health and are less than 76 years of age (NSF, 2019b). The SDR uses a fixed panel design with a new sample of doctorates added each survey cycle and includes 76 items related to respondent's demographics, educational history, employment status, field of degree, and occupation. The SDR is completed either through a self-administered mail questionnaire, a self-administered online survey, or a computer-assisted telephone interview. Most participants complete the survey through the online method. From 1973 to 2008, the SDR survey was administered only to persons residing in the US;

however, in 2010 the sample was expanded to also include those residing outside the US. In 2015, the sample was substantially increased from 40,000 to 120,000 to improve estimations of fine-level employment outcomes.

With each cycle of the SDR, the NCSES produces an individual data file (ex. 2015 SDR) as well as a separate file including all matching SED records for respondents in the SDR sample. This multi-year SED data file is called the Doctorate Records File (DRF). To aid researchers in matching records across files, respondents are assigned a unique identifier (DRF_ID). For this study, the researcher obtained access to NCSES data files by receiving approval for a data request and license agreement for restricted-use data. Variables were drawn from three files: SDR 2015, SDR 2017, and DRF 2015.

Sample

Respondents represented in the three NCSES, NSF data files included a broader sample of S&E professionals, therefore it was necessary to remove observations in order to achieve the study sample. First, all three data files were merged in STATA 16 and observations missing the file for either the SDR 2015 or SDR 2017 were removed. To limit the sample to those employed at research universities, only respondents working for institutions classified as Carnegie R1 or R2 were included (CARN05C = 15 or 16). Faculty status was defined as individuals whose academic position was as an adjunct faculty (ACADADJF = Y), research faculty (ACADRCHF = Y), teaching faculty (ACADTCHF = Y), or dean (ACADDEAN = Y) and worked at least 40 hours per week at their principal job (HRSWK > 39). Respondents also listing their position as postdocs (ACADPDOG = Y) were removed from the sample. To narrow the sample to faculty working in S&E fields, those in non-S&E related occupations were removed (N2OCPRMG = 7). International status was defined as respondents who were born outside the US (BTHRGN > 9)

and were not native US citizens (CITIZ = 2, 3, 4, or A). As this study sought to explore voluntary turnover, respondents who left their position because of retirement (CHRET = Y) or were laid off/terminated (CHLAY = Y) were removed from the sample. The resulting sample used in this study included 1,730 respondents.

Research Variables

The following section briefly describes the survey items that correspond with the dependent and independent variables selected for this study. Since items are taken from multiple NCSES, NSF data files, Table 3.1 provides an overview of all variables and the variable sources. In addition, the full 2014 SED instrument is provided in Appendix A and the full 2015 SDR instrument is provided in Appendix B.

Dependent Variable

The dependent variable for this study was a dichotomous variable indicating whether the individual left their job for reasons other than retirement or being laid off/terminated. This study used the variable EMSMI: Job Same Employer from the SDR 2017 which included the response to the question “During these two time periods – the week of February 1, 2015, and the week of February 1, 2017 – were you working for...”. Response options were:

- 1: Same employer AND same job
- 2: Same employer BUT different job
- 3: Different employer BUT same job
- 4: Different employer AND different job

Since faculty positions are very specialized, it is unlikely changing jobs while remaining with the same employer resulted in the department losing the person. From an initial review of the data, most often what is represented is a promotion within the same field. Therefore,

Table 3.1
Variables Used in the Study

Variable Label	Variable Source
DEPENDENT VARIABLE	
Changed job between 2015 - 2017	SDR 2017 B2
INDEPENDENT VARIABLES	
<i>Perceived desirability of movement factors</i>	
Satisfaction with salary	SDR 2015 A34.1
Satisfaction with benefits	SDR 2015 A34.2
Satisfaction with job security	SDR 2015 A34.3
Satisfaction with job location	SDR 2015 A34.4
Satisfaction with opportunities for advancement	SDR 2015 A34.5
Satisfaction with intellectual challenge	SDR 2015 A34.6
Satisfaction with level of responsibility	SDR 2015 A34.7
Satisfaction with degree of independence	SDR 2015 A34.8
Satisfaction with contribution to society	SDR 2015 A34.9
Overall job satisfaction	SDR 2015 A35
<i>Perceived ease of movement factors</i>	
Personal Factors	
Gender	SDR 2015 (recode from SED)
Race	SDR 2015 (recode from SED)
Marital status	SDR 2015 E1
Children living in home	SDR 2015 E4
Birth region	SDR 2015 (recode from SED)
Citizenship status	SDR 2015 (recode)
Age	SDR 2015 (recode)
Employment Factors	
Faculty rank	SDR 2015 A17
Tenure status	SDR 2015 A18
Broad job field	SDR 2015 (recode)
Job benefits: pension plan	SDR 2015 A41.2
Job benefits: profit sharing	SDR 2015 A41.3
Job benefits: paid vacation/sick leave	SDR 2015 A41.4
Length of employment in same position	SDR 2015 A26
Organizational Visibility Factors	
Government supported work	SDR 2015 A42
Attend professional org meeting	SDR 2015 C4
Number of professional org membership	SDR 2015 C5
<i>Institutional Factors</i>	
Institution control (public vs. private)	SDR 2015 (system)
Institution Carnegie classification	SDR 2015 (system)
Location (region)	SDR 2015 (recode)

Notes: SED = Survey of Earned Doctorates, DRF = Doctorate Records File

respondents who answered 1 or 2 were labeled as not leaving their job ($y = 0$) and those who answered 3 or 4 were labeled as leaving their job ($y = 1$). The sample showed 6.07% of respondents leaving their job during the time frame studied.

Independent Variables

Perceived desirability of movement factors. Ten job satisfaction items from the SDR 2015 represented perceived desirability of movement, all of which come from the principal job section. Nine of these items asked the respondent to rank their satisfaction with specific aspects of their current job including salary, benefits, job security, job location, opportunities for advancement, intellectual challenge, level of responsibility, degree of independence, and contribution to society. Responses were collected on a four-point Likert scale ranging from very satisfied to very dissatisfied. The final job satisfaction question asked the respondent to rank their overall job satisfaction on the same four-point Likert scale.

Perceived ease of movement factors. Perceived ease of movement was represented through selection of variables in three sub-categories: personal factors, employment factors, and organizational visibility factors. Personal factors consisted of variables for age, gender, race, marital status, children living at home, birth region, and citizenship status all drawn from the 2015 SDR. Some variables such as age, gender, race, birth region, and citizenship status were recoded by NCSES, NSF to provide more accurate or consistent data. All questions were multiple choice except for age, which required the respondent to write in their date of birth, and birth region, which was an open-ended survey question.

Employment factors consisted of variables for faculty rank, tenure status, broad job field, job benefits, and length of employment all drawn from the SDR 2015. Faculty rank, tenure status, and job benefits responses were multiple-choice selection, while the length of

employment question was open-ended response. The broad job field was a recode by NCSES, NSF based on a more detailed job field survey item in which the respondent categorized their primary employment based on a two-page list of possible job categories, such as Engineering Teachers/Professors – Postsecondary.

Organizational visibility factors consisted of variables for government supported work, attendance at professional organization meeting, and number of professional organization memberships all drawn from the SDR 2015. Government supported work and attendance at a professional meeting were multiple-choice survey items, while professional organization memberships was open-ended.

Institutional factors. The three institutional factors used in this study are also drawn from the SDR 2015: institutional control (public vs. private), institution 2005 Carnegie Basic Classification, and regional location of the institution. All three of these items are recodes by the NCSES, NSF based upon the SDR 2015 survey item that asks the respondent to write in the name and address of their principal employer.

Data Analysis

This study answered the research questions through descriptive summary statistics and binary logistic regression. The following section outlines the data procedures that ensured the integrity of the data as well as confirmed assumptions of binary logistic regression analysis. In addition, a summary of the analytical method and procedures are provided.

Data Preparation and Testing of Assumptions

Prior to conducting statistical analysis of the data, the researcher ensured data integrity through preliminary analyses. Frequency and descriptive statistics summary were conducted using STATA 16 on all variables to check for initial data issues such as outliers, coding errors, or

missing data. Any issues discovered were corrected and data were prepared for further analysis. To prepare the independent variables, all discrete, nominal, variables were recoded into dummy variables (Hosmer & Lemeshow, 2013). Additionally, the dependent variable was coded so that a value of “1” was assigned to the category of interest, leaving the job, and “0” to the remaining category, staying in the job.

RQ1 and RQ2 were answered through descriptive statistics summary, therefore no testing of assumptions was required. However, RQ3 through RQ6 employed binary logistic regression which requires assumptions of linearity in the logit and absence of multicollinearity to be met (Menard, 2010). Linearity of the logit requires that for a one-unit change in X, the logit (Y) changes at a constant rate. This assumption was checked for all continuous independent variables (age, length of employment in same position, and number of professional organization memberships) by creating a locally weighted scatterplot smoothing graph using the *lowess* command in STATA. Graph results showed the assumption of linearity of the logit was not met, therefore these continuous variables were broken into categorical variables.

High multicollinearity among independent variables can affect the significance and coefficient of variables in an analysis. To check for high level of multicollinearity, tolerance levels and Variance Inflation Factor (VIF) were checked for all independent variables. A tolerance level of less than .2 is somewhat a cause for concern and less than .10 is very likely an indicator of a serious problem in collinearity (Menard, 2010). Similarly, a VIF over 5 may be troublesome and over 10 is generally agreed to be too high in collinearity. Both VIF and tolerance were checked in STATA using the *vif* command. When all independent variables were checked together, a moderately high level of collinearity was found between tenure status and faculty rank variables, with the highest among tenure track status (VIF=7.10, tolerance=.1409),

however this level of collinearity was deemed acceptable and the variables remained in the analyses.

Related to multicollinearity, zero or small cell sizes were checked for all categorical variables through crosstabulation of each independent variable and the dependent variable (Menard, 2010). Since the occurrence of the dependent variable was 6.07% there were several variables where issues of cell sizes were encountered. These variables were recoded or categories were collapsed to ensure all cell counts exceeded five. All job satisfaction variables were collapsed from a four-point Likert scale to a two-point Likert scale: satisfied or dissatisfied. Race was collapsed into three categories: Asian, White, and Other (includes American Indian/Alaska Native, Black, Native Hawaiian/Other Pacific Islander, Multiple Races). Marital status was collapsed into two categories: not married and married (includes married or living in a marriage-like relationship). Birth region was collapsed into five categories: Europe, Asia, North America (North America, Central America, and Caribbean), South America, and other (Africa, Oceania, and non-specified abroad). Faculty rank was collapsed into five categories: professor, associate professor, assistant professor, not applicable (includes not applicable at institution or for my position), and other (includes instructor, lecturer, and other).

Analytical Method

To answer the research questions presented at the beginning of this chapter, two analyses in STATA were used: descriptive statistics summary and binary logistic regression. RQ1 and RQ2 were answered by running descriptive statistics commands in STATA to identify the characteristics of international S&E faculty employed at US research universities and, for those who leave their job, the type of job they find next. Results were presented in frequencies and percentages.

The remaining four research questions (RQ 3 – RQ6) were answered using binary logistic regression analysis, which seeks to identify the best fitting and most reasonable model to describe the relationship between an outcome and a set of predictors (Hosmer & Lemeshow, 2013). Binary logistic regression is distinguished from linear regression by the inclusion of a dichotomous dependent variable (yes or no), while the independent variables can be continuous or categorical. Since the dependent variable in this study is dichotomous and all independent variables are categorical, this statistical analysis was an appropriate method for answering these research questions.

The results of binary logistic regression provide the predicted probability of an outcome occurring. For example, in RQ6, this analysis provided the probability that an international faculty would leave their position given a specific set of predictors. The regression model is represented by the equation:

$$\pi(x) = \frac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}}$$

Where “ $\pi(x)$ ” is the conditional probability of the Y given x when the logistic distribution is used (Hosmer & Lemeshow, 2013). The logit transformation serves as the link function, which allows the outcome to range from $-\infty$ to $+\infty$. Another useful interpretation from binary logistic regression is the odds ratio, which measures how much more likely or unlikely the presence of the outcome is determined by the ratio of the odds of an outcome being present to the odds of an outcome not being present. Due to the ease of interpretation, the odds ratio from binary logistic regression was used to interpret study results (DeMaris, 1995).

Rather than entering all independent variables at once, multiple binary logistic regression models were first built to examine how specific categories of independent variables predicted the

decision to leave the job, then all variable categories were combined in a final model. This allowed the researcher to determine the impact of each category of variables on the final model. RQ3 was answered through one binary logistic regression model with all perceived desirability of movement variables (i.e. job satisfaction). RQ4 was answered through four binary logistic regression models: only personal factors (i.e. gender, race, marital status, having children, birth region, citizenship, and age), only employment factors (i.e. faculty rank, tenure, job field, job benefits, and employment length), only organizational visibility factors (government supported work, and professional organizations), and all ease of movement factors combined. RQ5 five was answered through one binary logistic regression model with all institutional factors (i.e. institutional control, Carnegie classification, region). Finally, RQ6 was answered by including all independent variable categories in the binary logistic regression model: perceived desirability of movement factors, perceived ease of movement factors, and institutional factors.

Many are familiar with ordinary least squares in linear regression, which produces the R^2 statistic to measure the explanatory power of the model. Binary logistic regression does not have this measure; however, having R^2 is useful in determining explanatory power of a model in linear regression. Therefore, this study employed McFadden's R^2 , a commonly used pseudo- R^2 (Veall & Zimmermann, 1996). The higher the pseudo- R^2 , the higher the explanatory power of the model. This study estimated pseudo- R^2 for each model and compared explanatory power across models. In addition, the goodness of fit was measured to determine the effectiveness of the model in describing the outcome variable, or how much the model deviates from the ideal model. This study employed Hosmer and Lemeshow's Goodness of Fit Test, a commonly used test in social science research, to determine the fit of the model. A p-value larger than .05 indicated the model fit was acceptable for this study. Odds ratios are presented in the following

chapter for each model, which represented the odds of an international S&E faculty leaving their job.

Summary

This chapter has reviewed the purpose of the study and research questions and outlined the analysis used in this study. Data for this study were drawn from the Survey of Earned Doctorates (SED) and Survey of Doctorate Recipients (SDR), which are administered by the National Center for Science and Engineering Statistics, National Science Foundation (NCSES, NSF). As this data source includes a broader sample than what was used in this study, the sample was refined to only international S&E faculty at US research universities. The dependent variable in the study was whether or not international S&E faculty left their job between the 2015 and 2017 SDR. The independent variables were grouped into three categories: perceived desirability of movement factors, perceived ease of movement factors, and institutional factors. Descriptive statistics summary and binary logistic regression provided the best method to answer the research questions posed. Chapter 4 provides the results of these analyses.

CHAPTER IV

FINDINGS

Introduction

The purpose of this study was to gain a better understanding of international S&E faculty who left their job at a US research university and their career path after departure. Six research questions guided this study:

- RQ1. What are the descriptive statistics of international S&E faculty employed at US research universities?
- RQ2. Of international S&E faculty who leave their job, what are the characteristics of their next position?
- RQ3. What perceived desirability of movement factors (i.e. job satisfaction) predict international S&E faculty's decision to leave their job?
- RQ4. What perceived ease of movement factors (i.e. gender, race, marital status, having children, birth region, citizenship, age, faculty rank, tenure, job field, job benefits, employment length, government supported work, professional organizations) predict international S&E faculty's decision to leave their job?
- RQ5. What institutional factors (i.e. institutional control, Carnegie classification, region) predict international S&E faculty's decision to leave their job?
- RQ6. How do perceived desirability of movement, perceived ease of movement, and institutional factors influence international S&E faculty's decision to leave their job?

This chapter presents the findings of this study through descriptive statistics summary and binary logistic regression through the data analyses described in Table 4.1. First, RQ1 and RQ2 are answered through summaries of frequency and percentages of variables of interest.

Table 4.1

Summary of Data Analyses

Research Question	Data Analysis
RQ1. What are the descriptive statistics of international S&E faculty employed at US research universities?	Descriptive statistics: frequency and percentage
RQ2. Of international S&E faculty who leave their job, what are the characteristics of their next position?	Descriptive statistics: frequency and percentage
RQ3. What perceived desirability of movement factors (i.e. job satisfaction) predict international S&E faculty's decision to leave their job?	Model 1: Binary logistic regression analysis on perceived desirability of movement variables
	Model 2: Binary logistic regression analysis on personal factors
RQ4. What perceived ease of movement factors (i.e. gender, race, marital status, having children, birth region, citizenship, age, faculty rank, tenure, job field, job benefits, employment length, government supported work, professional organizations) predict international S&E faculty's decision to leave their job?	Model 3: Binary logistic regression analysis on employment factors
	Model 4: Binary logistic regression analysis on organizational visibility factors
	Model 5: Binary logistic regression analysis on all perceived ease of movement variables (personal, employment, and organizational visibility)
RQ5. What institutional factors (i.e. institutional control, Carnegie classification, region) predict international S&E faculty's decision to leave their job?	Model 6: Binary logistic regression analysis on institutional factors
RQ6. How do perceived desirability of movement, perceived ease of movement, and institutional factors influence international S&E faculty's decision to leave their job?	Model 7: Binary logistic regression analysis on perceived desirability of movement, perceived ease of movement, and institutional factors

Next, several binary logistic regression models were built to answer RQ3 – RQ6. Each model addressed a category of variables which were examined to determine what factors predicted the decision of international S&E faculty to leave their job. RQ3 was answered through Model 1, which examined how perceived desirability of movement variables predicted the decision to leave. RQ4 was answered through Models 2 – 5 with a model for each sub-category of perceived ease of movement factors (personal, employment, and organizational visibility) and a full model with all perceived ease of movement factors. RQ5 was answered through Model 6, which examined how institutional factors predicted the decision to leave. Finally, RQ6 was answered through Model 7, which examined how all combined perceived desirability of movement, perceived ease of movement, and institutional factors predicted the decision to leave.

While binary logistic regression produces a coefficient, this study primarily used the odds ratio to interpret results as it is more easily understood (DeMaris, 1995). The odds ratio is calculated as $\exp(B)$ and for dummy variables it represents the difference between membership in a category and membership in the omitted category of the analysis. In this study, an odds ratio greater than 1 indicates a positive effect on the odds of faculty leaving their job, while ratios less than 1 indicate a negative effect on the odds of faculty leaving their job.

Results for Research Question 1

Sample Descriptive Statistics

Table 4.2 presents the descriptive statistics of the independent variables of the study sample at the time of their 2015 response to the SDR. Of the 1,730 faculty in the sample, 68% were male and 32% were female. Age was categorized into three categories: 13% were 30 and under, 65% were 36 to 52, and 21% were 55 and older. Considering the cultural background, 53% were born in Asia, 22% in Europe, 10% in North America, 9% in South America, and

Table 4.2
Descriptive Statistics of the Study Sample (N=1,730)

Label	%	N
PERCEIVED DESIRABILITY OF MOVEMENT FACTORS		
Salary		
Satisfied	72.95	1,262
Dissatisfied	27.05	468
Benefits		
Satisfied	89.54	1,549
Dissatisfied	10.46	181
Job Security		
Satisfied	84.10	1,455
Dissatisfied	15.90	275
Job Location		
Satisfied	85.90	1,486
Dissatisfied	14.10	244
Opportunity for Advancement		
Satisfied	75.38	1,304
Dissatisfied	24.62	426
Intellectual Challenge		
Satisfied	94.51	1,635
Dissatisfied	5.49	95
Level of Responsibility		
Satisfied	92.25	1,596
Dissatisfied	7.75	134
Degree of Independence		
Satisfied	94.51	1,635
Dissatisfied	5.49	95
Contribution to Society		
Satisfied	95.32	1,649
Dissatisfied	4.68	81
Overall Job		
Satisfied	91.68	1,586
Dissatisfied	8.32	144
PERCEIVED EASE OF MOVEMENT FACTORS		
<i>Personal Factors</i>		
Gender		
Male	67.57	1,169
Female	32.43	561

Table 4.2 (continued)

	Label	%	N
Race			
	Asian	47.28	818
	White	46.30	801
	Other	6.42	111
Marital Status			
	Married	86.76	1,501
	Not-married	13.24	229
Children Living in Home			
	Yes	58.09	1,005
	No	41.91	725
Birth Region			
	Asia	52.89	915
	Europe	21.85	378
	North America	9.71	168
	South America	9.25	160
	Other	6.30	109
Citizenship			
	US Citizen, Naturalized	49.77	861
	Non-US Citizen, Permanent Resident	40.23	696
	Non-US Citizen, Temporary Resident	10.00	173
Age			
	35 and under	13.29	230
	36 to 54	65.61	1,135
	55 and older	21.10	365
<i>Employment Factors</i>			
Faculty Rank			
	Assistant Professor	28.38	491
	Associate Professor	25.66	444
	Professor	29.60	512
	Other	3.12	54
	Not applicable	13.24	229
Tenure Status			
	Tenured	48.96	847
	Tenure-track	22.08	382
	Not tenure-track	13.47	233
	Not applicable	15.49	268

Table 4.2 (continued)

Label	%	N
Broad Job Field		
Computer and Mathematical Scientists	15.09	261
Biological, Agricultural, and Other Life Scientists	22.25	385
Physical and Related Scientists	17.51	303
Social and Related Scientists	14.51	251
Engineers	23.76	411
S&E Related Occupations	6.88	119
Pension/Retirement Plan Available		
Yes	96.82	1,675
No	3.18	55
Profit-Sharing Plan Available		
Yes	91.33	1,580
No	8.67	150
Paid Vacation/Sick/Personal Days Available		
Yes	79.13	1,369
No	20.87	361
Years at Current Job		
Less than 3	21.68	375
3 to 5	20.40	353
6 to 8	13.93	241
9 or more	43.99	761
<i>Organizational Visibility Factors</i>		
Work Supported by US Government		
Yes	62.08	1,074
No	37.92	656
Attended Professional Meeting in Last Year		
Yes	88.90	1,538
No	11.10	192
Number of Professional Organization Memberships		
None	8.44	146
1 to 2	48.32	836
3 to 4	33.18	574
5 or more	10.06	174
INSTITUTIONAL FACTORS		
Control		
Public Institution	68.67	1,188
Private Institution	31.33	542

Table 4.2 (continued)

	Label	%	N
2005 Carnegie Classification			
	R1: Very High Research Activity	75.09	1,299
	R2: High Research Activity	24.91	431
Region			
	Northeast	19.71	341
	Midwest	24.86	430
	South	33.47	579
	West	21.97	380

6% in either Africa, Oceania, or a non-specific abroad location. Most were Asian (47%) or White (46%) with all other races making up 6%. When examining citizenship status as reported in 2015, half were naturalized US citizens and the other half were non-US citizens with some form of US resident status (40% permanent residents and 10% temporary residents). Married or living in a marriage-like relationship described the majority of the sample (87%) and 58% had children living in the home versus 42% without children living in the home.

In work roles, 24% were engineers, 22% biological, agricultural, and other life scientists, 18% physical and related scientists, 15% computer and mathematical scientists, 15% social and related scientists, and 7% other S&E related position. Many were tenured (49%) followed by 22% tenure-track, 13% not tenure-track, and 15% in positions where tenure was not applicable. A variety of faculty ranks were found: 28% assistant professors, 26% associate professors, 30% professors, 13% in roles without ranks, and 3% other faculty ranks. Many faculty had worked in their job for a significant number of years with 44% in the position for nine or more years, 14% six to eight years, 20% three to five years, and 22% less than three years. The majority of employers offered pension or retirement plan benefits (97%), profit-sharing plans (91%), or paid vacation, sick, or personal days (79%). Of the sample, 89% attended a professional organization meeting in the previous year and most were members in one to two organizations (48%) followed by 33% in three to four organizations, 10% in five or more organizations, and 8% in no organizations.

The sample also included faculty working for different types of higher education institutions. More were working for public institutions (69%) than private institutions (31%) and most institutions classified as R1: very high research activity (76%) versus R2: high research activity (25%) by 2005 Carnegie Basic Classification. The highest percentage of faculty were

found to work for an institution located in the South (33%), followed by the Midwest (25%), the West (22%), and the Northeast (20%).

Table 4.3 presents the rate at which the study sample left their job between February 2015 and February 2017. Approximately 6% of international S&E faculty in the sample left their job while approximately 94% remained in their job. The percent of stayers and leavers by select variables are shown in Table 4.4. Slightly more faculty at R1: very high research activity institutions left their job (6.47%) versus those at R2: high research activity institutions (4.87%). The lowest percentage of leavers by job field was seen for those working as engineers with 4.38% leaving, followed by computer and mathematical scientists with 4.98%, biological, agricultural, and other life scientists with 6.23%, social and related scientists with 7.17%, physical and related scientists with 7.26%, and other S&E related occupations with 8.4%. In regards to birth region, faculty born in South America had the highest percentage of leavers (9.38%) while those born in Asia had the lowest percentage of leavers (5.36%). Six percent of faculty born in Europe, 6.13% of faculty born in North America, and 7.34% of faculty born in all other regions left their jobs.

Results for Research Question 2

Characteristics of Next Position

For international S&E faculty who left their job, Table 4.5 describes characteristics of the job they held in February 2015 and the new job held in February 2017. Of the 105 faculty who left their jobs, 100% were living/working in the US at an educational institution in 2015. In 2017 however, 5% were living/working in their birth country outside the US and 7% were living/working outside the US in another country other than their birth country. The percentage of those working at educational institutions dropped to 68% with 9% moving to a job in

Table 4.3
Distribution of Decision to Leave Job

Label	%	N
Stay in Job	93.93	1,625
Leave Job	6.07	105

Table 4.4
Percentage Stayers and Leavers by Select Variables

Label	% Stay in Job	% Leave Job
2005 Carnegie Classification		
R1: Very High Research Activity	93.53	6.47
R2: High Research Activity	95.13	4.87
Broad Job Field		
Computer and Mathematical Scientists	95.02	4.98
Biological, Agricultural, and Other Life Scientists	93.77	6.23
Physical and Related Scientists	92.74	7.26
Social and Related Scientists	92.83	7.17
Engineers	95.62	4.38
S&E Related Occupations	91.60	8.40
Birth Region		
Europe	93.92	6.08
Asia	94.65	5.36
North America	96.93	6.13
South American	90.62	9.38
Other	92.66	7.34

Table 4.5
Job Characteristics of Next Position for Leavers (N=105)

Label	2015		2017		Δ %
	%	N	%	N	
Location					
Living/Working Birth Country (Non-US)	0.00	0	4.76	5	4.76
Living/Working in Other Foreign Country	0.00	0	6.67	7	6.67
Living/Working in US	100.00	105	88.57	93	-11.43
Employer Sector					
Educational Institution	100.00	105	67.62	71	-32.38
Government	0.00	0	8.57	9	8.57
Business/Industry	0.00	0	23.81	25	23.81
Broad Job Field					
Computer and Mathematical Scientists	12.38	13	14.29	15	1.90
Biological, Agricultural, and Other Life Scientists	22.86	24	18.10	19	-4.76
Physical and Related Scientists	20.95	22	17.14	18	-3.81
Social and Related Scientists	17.14	18	12.38	13	-4.76
Engineers	17.14	18	16.19	17	-0.95
S&E Related Occupations	9.52	10	13.33	14	3.81
Non-S&E Related Occupations	0.00	0	8.57	9	8.57

government and 24% to a job in business/industry. The sample also changed by faculty rank. The percentage of those in positions where faculty rank was not applicable increased by 16% to constitute 45% of the sample in 2017. The rank of professor also increased to 17% while assistant professor fell to 24%, associate professor fell to 10%, and other faculty rank to 5%. Faculty's broad job field changed most for those in non-S&E related occupations which was 0% of the sample in 2015 and 9% in 2017. The percentage of those working as computer and mathematical scientists rose to 14% while those working as biological, agriculture, and other scientists fell to 18%, physical and related scientist to 17%, social and related scientists to 12%, and engineers to 16%. Jobs that fell into the other S&E related occupations rose to 9% in 2017.

Results for Research Question 3

Model 1: Perceived Desirability of Movement Factors

Table 4.6 provides results of the binary logistic regression that addressed which perceived ease of movement factors predicted the decision of international S&E faculty to leave their job (Model 1). The pseudo- R^2 of Model 1 was .06. The Hosmer-Lemeshow goodness of fit p value was 0.85, which indicates the model was an acceptable fit for the data ($p > 0.05$). The results indicated that dissatisfaction with job location, intellectual challenge, and the overall job were significant predictors of the decision of international S&E faculty to leave their job. Faculty who indicated they were dissatisfied with their job location had 1.67 greater odds of leaving than those who were satisfied with their job location ($p < 0.05$). In addition, faculty who were dissatisfied with the intellectual challenge of their job had more than two times greater odds of leaving than those who were satisfied with the intellectual challenge (odds ratio = 2.02, $p < 0.05$), while faculty who were dissatisfied with their overall job had nearly three times greater odds of leaving than those who were satisfied (odds ratio = 2.71, $p < 0.05$). Dissatisfaction with

Table 4.6

Model 1: Logistic Regression Results for Perceived Desirability of Movement Factors

Variable	Coeff.	OR	SE	Sig.
Dissatisfied with Salary	-0.36	0.70	0.26	
Dissatisfied with Benefits	-0.18	0.84	0.34	
Dissatisfied with Job Security	0.28	1.32	0.26	
Dissatisfied with Job Location	0.51	1.67	0.26	*
Dissatisfied with Opportunities for Advancement	0.45	1.57	0.26	
Dissatisfied with Intellectual Challenge	0.70	2.02	0.34	*
Dissatisfied with Level of Responsibility	-0.11	0.89	0.37	
Dissatisfied with Degree of Independence	0.42	1.52	0.37	
Dissatisfied with Contribution to Society	-0.80	0.45	0.48	
Dissatisfied with Overall Job	1.01	2.74	0.34	**

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

salary, benefits, job security, opportunities for advancement, level of responsibility, degree of independence, and contribution to society were not found to significantly predict the decision of international S&E faculty to leave.

Results for Research Question 4

This section presents the results of binary logistic regression analyses that addressed which perceived ease of movement factors predicted the decision of international S&E faculty to leave their job. Perceived ease of movement factors consisted of three distinct sub-categories: personal, employment, and organizational visibility factors. To determine the explanatory power of each sub-category, a separate logistic regression model was built for each sub-category (Models 2 – 4) before combining all perceived ease of movement factors in Model 5.

Model 2: Personal Factors

Table 4.7 presents the results of the binary logistic regression that addressed which personal factors predicted the decision of international S&E faculty to leave their job (Model 2). The pseudo- R^2 of the model was .05, which indicates this model did not predict the outcome as well as Model 1 (pseudo- $R^2 = .06$). The Hosmer-Lemeshow goodness of fit p value was 0.46, which indicates the model was an acceptable fit for the data ($p > 0.05$). The results indicated that having children living at home and the age of the faculty were significant predictors of the decision of international S&E faculty to leave their job. Faculty with no children living in the home had 1.60 greater odds of leaving than faculty with children living in the home ($p < 0.05$). When comparing age, however, faculty 55 and older had 79% lower odds of leaving than those in the 36-54 age range (odds ratio = 0.21, $p < 0.01$). Gender, birth region, and citizenship were not found to significantly predict the decision to leave.

Table 4.7
Model 2: Logistic Regression Results for Personal Factors

Variable	Coeff.	OR	SE	Sig.
Female	-0.04	0.96	0.22	
Race				
Asian	-0.22	0.81	0.38	
Other	-0.15	0.86	0.46	
Not Married	-0.64	0.53	0.35	
No Children Living at Home	0.47	1.60	0.23	*
Birth Region				
Europe	-0.11	0.90	0.41	
North America	-0.13	0.88	0.47	
South America	0.55	1.73	0.45	
Other	0.51	1.66	0.53	
Citizenship				
Non-US Citizen, Permanent Resident	0.41	1.51	0.23	
Non-US Citizen, Temporary Resident	0.17	1.19	0.37	
Age				
35 and under	0.32	1.38	0.28	
55 and older	-1.58	0.21	0.45	**

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

Model 3: Employment Factors

Table 4.8 provides results of the binary logistic regression that addressed which employment factors predicted the decision of international S&E faculty to leave their job (Model 3). The pseudo-R² was .10, which indicates greater explanatory power than either perceived desirability of movement factors (Model 1) or personal factors (Model 2). Model 3 was also deemed to be an acceptable fit for the data with a Hosmer-Lemeshow goodness of fit *p* value of 0.94 (*p* > 0.05). The results indicated that tenure status, job benefits, and years working at the current job were significant predictors of the decision of international S&E faculty to leave their job. Compared to faculty who were tenure-track, those in positions that were not tenure track had over three times greater odds of leaving (odd ratio = 3.42, *p* < 0.01) and those in positions where tenure status was not applicable had nearly three times greater odds of leaving (odd ratio=2.87, *p* < 0.01). Jobs which offered a pension or retirement plan as a benefit reduced the odds that a faculty would leave their job by 61% compared to jobs without this benefit available (odds ratio = 0.39, *p* < 0.05). Low amounts of time spent in a job resulted in higher odds of leaving. Both faculty in the job for less than three years (odds ratio=3.41, *p* < 0.01) and faculty in the job three to five years (odds ratio = 3.44, *p* < 0.01) had over three times greater odds of leaving than those in their job for more than eight years. No significant predictors were found for faculty rank or by broad job field when all other employment factors were included.

Model 4: Organizational Visibility Factors

Table 4.9 provides results of the binary logistic regression that addressed which organizational visibility factors predicted the decision of international S&E faculty to leave their job (Model 4). The pseudo-R² was .001, which was much lower than any of the previous models. The Hosmer Lemeshow goodness of fit *p* value was .68, which indicated the model was

Table 4.8
Model 3: Logistic Regression Results for Employment Factors

Variable	Coeff.	OR	SE	Sig.
Faculty Rank				
Associate Professor	-0.55	0.58	0.48	
Professor	-0.52	0.60	0.55	
Other	-0.06	0.94	0.47	
Not Applicable	0.03	1.04	0.34	
Tenure Status				
Tenured	0.54	1.71	0.56	
Not Tenure-Track	1.23	3.42	0.35	**
Not Applicable	1.05	2.87	0.39	**
Broad Job Field				
Computer and Mathematical Scientists	0.11	1.11	0.39	
Biological, Agricultural, and Other Life Scientists	-0.05	0.95	0.34	
Physical and Related Scientists	0.26	1.30	0.35	
Social and Related Scientists	0.51	1.66	0.36	
S&E Related Occupations	0.33	1.39	0.43	
Pension/Retirement Plan Available	-0.94	0.39	0.39	*
Profit-Sharing Plan Available	0.23	1.26	0.33	
Paid Vacation/Sick/Personal Days Available	-0.29	0.75	0.28	
Years at Current Job				
Less than 3	1.23	3.41	0.37	**
3 to 5	1.24	3.44	0.37	**
6 to 8	0.67	1.96	0.41	

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

Table 4.9

Model 4: Logistic Regression Results for Organizational Visibility Factors

Variable	Coeff.	OR	SE	Sig.
Work Not Supported by US Government	0.16	1.17	0.21	
Did Not Attend Professional Meeting Last Year	-0.40	0.67	0.37	
Number of Professional Organization Memberships				
None	0.63	1.87	0.35	
3 to 4	-0.15	0.86	0.23	
5 or more	-0.19	0.82	0.37	

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

an acceptable fit, however, the results indicated no organizational visibility factors were significant predictors of the decision of international S&E faculty to leave their job.

Model 5: All Perceived Ease of Movement Factors

Table 4.10 provides results of the binary logistic regression that addressed which combined perceived ease of movement factors (personal, employment, and organizational visibility) predicted the decision of international S&E faculty to leave their job (Model 5). This model produced a pseudo- R^2 of .15, which was higher than any of the previous models. The Hosmer Lemeshow goodness of fit p value was 0.25, which indicated the model was an acceptable fit ($p > 0.05$). All variables which were significant predictors in previous Models 2 (personal factors), 3 (employment factors), and 4 (organizational visibility factors) continued to be significant in this model, however, attendance at a professional meeting in the last year was also found to be a significant predictor of the decision of international S&E faculty to leave their job. Among personal factors, no children living at home ($p < 0.05$) and being 55 and older ($p < 0.01$) continued to be significant predictors of faculty leaving their job, however, the odds ratio changed for both. Faculty with no children living at home had 1.72 greater odds of leaving than those with no children living at home, which was an increase of 0.12 in the odds ratio compared to Model 2. The odds of faculty 55 years and older leaving compared to those ages 36 to 54 increased slightly from Model 2 so that the odds of faculty 55 had an odds ratio of 0.24 ($p < 0.01$). Among tenure status variables, both jobs which were not tenure-track and those where tenure track was not applicable continued to be significant ($p < 0.01$), and odds ratios increased compared to Model 3. In Model 5, non-tenure-track faculty had over four times greater odds of leaving (odds ratio = 4.62) and those in jobs where tenure track was not applicable had over three times greater odds of leaving (odds ratio = 3.76) than faculty in tenure-track jobs. Compared to

Table 4.10

Model 5: Logistic Regression Results for Perceived Ease of Movement Factors

Variable	Coeff.	OR	SE	Sig.
<i>Personal Factors</i>				
Female	-0.39	0.68	0.24	
Race				
Asian	-0.17	0.84	0.39	
Other	-0.18	0.83	0.50	
Not Married	-0.65	0.52	0.37	
No Children Living at Home	0.54	1.72	0.24	*
Birth Region				
Europe	0.02	1.02	0.42	
North America	-0.13	0.88	0.49	
South America	0.68	1.97	0.46	
Other	0.90	2.46	0.55	
Citizenship				
Non-US Citizen, Permanent Resident	-0.67	0.51	0.40	
Non-US Citizen, Temporary Resident	0.01	1.01	0.26	
Age				
35 and under	0.17	1.19	0.30	
55 and older	-1.43	0.24	0.49	**
<i>Employment Factors</i>				
Faculty Rank				
Associate Professor	-0.65	0.52	0.50	
Professor	-0.37	0.69	0.58	
Other	0.07	1.08	0.50	
Not Applicable	0.17	1.19	0.35	
Tenure Status				
Tenured	0.61	1.84	0.58	
Not Tenure-Track	1.53	4.62	0.37	**
Not Applicable	1.32	3.76	0.41	**
Broad Job Field				
Computer and Mathematical Scientists	0.07	1.08	0.40	
Biological, Agricultural, and Other Life Scientists	-0.04	0.96	0.35	
Physical and Related Scientists	0.33	1.39	0.36	
Social and Related Scientists	0.57	1.77	0.38	
S&E Related Occupations	0.41	1.50	0.45	
Pension/Retirement Plan Available	-1.09	0.34	0.41	**
Profit-Sharing Plan Available	0.27	1.30	0.34	
Paid Vacation/Sick/Personal Days Available	-0.31	0.74	0.29	

Table 4.10 (continued)

Variable	Coeff.	OR	SE	Sig.
<i>Years at Current Job</i>				
Less than 3	1.07	2.93	0.40	**
3 to 5	1.08	2.94	0.39	**
6 to 8	0.53	1.70	0.42	
<i>Organizational Visibility Factors</i>				
Work Not Supported by US Government	0.02	1.02	0.23	
Did Not Attend Professional Meeting Last Year	-1.02	0.36	0.40	*
<i>Number of Professional Organization Memberships</i>				
None	0.53	1.71	0.37	
3 to 4	0.08	1.08	0.26	
5 or more	0.17	1.18	0.40	

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

Model 3, the odds of leaving decreased slightly for faculty in jobs with pension or retirement plans available and the level of significance increased (odds ratio = 0.34, $p < 0.01$). Years working the job remained at the same level of significance, however the odds ratio decreased for both those in the job for less than three years and those in the job for three to five years. Faculty who had worked in their job for less than three years (odds ratio = 2.93, $p < 0.01$) and faculty who had worked in their job for three to five years (odds ratio = 2.94, $p < 0.01$) had almost three times greater odds of leaving than those who had worked in their job for more than eight years. While no organizational visibility factors in Model 4 were significant, attendance at a professional organization meeting in the last year was significant in Model 5. Faculty who did not attend a professional organization meeting in the last year had an odds ratio of 0.36 of leaving compared those who attended a professional organization meeting ($p < 0.05$).

Results for Research Question 5

Model 6: Institutional Factors

Table 4.11 provides results of the binary logistic regression that addressed which institutional factors predicted the decision of international S&E faculty to leave their job (Model 6). The pseudo- R^2 of Model 6 was .008, which means this set of factors had less explanatory power than perceived desirability of movement factors (Model 1) and perceived ease of movement factors (Model 4). The Hosmer Lemeshow goodness of fit p value was .87, which indicated the model was an acceptable fit, however, the results indicated no factors were significant predictors of the decision of international S&E faculty to leave their job.

Table 4.11

Model 6: Logistic Regression Results for Institutional Factors

Variable	Coeff.	OR	SE	Sig.
Control (Private)	0.17	1.18	0.22	
R2: High research activity	-0.35	0.71	0.26	
Region				
Northeast	-0.10	0.90	0.28	
Midwest	-0.18	0.83	0.26	
West	-0.60	0.55	0.31	

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

Results for Research Question 6

Model 7: Combined Perceived Desirability of Movement, Perceived Ease of Movement, and Institutional Factors

Table 4.12 provides results of the final binary logistic regression that addressed which combined perceived desirability of movement, perceived ease of movement, and institutional factors predicted the decision of international S&E faculty to leave their job (Model 7). The pseudo-R² was .19, which was the highest explanatory power of all the models. The Hosmer Lemeshow goodness of fit *p* value was 0.91, which indicated the model fit was acceptable ($p > 0.05$). The results indicated that dissatisfaction with job location, dissatisfaction with the overall job, having children living at home, age, tenure status, job benefits, years working at the current job, and attendance at a professional meeting in the last year were significant predictors of the decision of international S&E faculty to leave their job.

Among perceived desirability of movement factors, dissatisfaction with job location and the overall job were both significant predictors of faculty leaving their job. Faculty who were dissatisfied with the location of their job had 1.78 greater odds of leaving compared to faculty who were satisfied with the location ($p < 0.05$). While this factor was also significant in Model 1 (odds ratio = 1.67, $p < 0.05$), controlling for perceived ease of movement and institutional factors in Model 7 caused the odds of leaving to increase for faculty dissatisfied with their job location. Similarly, the odds of leaving for those dissatisfied with their job increased from Model 1 to Model 7. By adding in additional factors in Model 7, faculty who were dissatisfied with their overall job had nearly three times greater odds of leaving than those who were satisfied with their overall job (odds ratio = 2.90, $p < .01$). Dissatisfaction with intellectual challenge of the job was no longer found to be a significant predictor of faculty leaving their job once controlling for

Table 4.12
 Model 7: Logistic Regression Results for Combined Perceived Desirability of Movement,
 Perceived Ease of Movement, and Institutional Factors

Variable	Coeff.	OR	SE	Sig.
PERCEIVED DESIRABILITY OF MOVEMENT FACTORS				
Dissatisfied with Salary	-0.23	0.79	0.28	
Dissatisfied with Benefits	-0.14	0.87	0.38	
Dissatisfied with Job Security	-0.48	0.62	0.30	
Dissatisfied with Job Location	0.57	1.78	0.29	*
Dissatisfied with Opportunities for Advancement	0.32	1.38	0.29	
Dissatisfied with Intellectual Challenge	0.62	1.86	0.39	
Dissatisfied with Level of Responsibility	0.13	1.14	0.39	
Dissatisfied with Degree of Independence	-0.08	0.93	0.42	
Dissatisfied with Contribution to Society	-0.89	0.41	0.53	
Dissatisfied with Overall Job	1.06	2.90	0.38	**
PERCEIVED EASE OF MOVEMENT FACTORS				
<i>Personal Factors</i>				
Female	-0.41	0.66	0.25	
Race				
Asian	-0.08	0.93	0.40	
Other	-0.23	0.79	0.52	
Not Married	-0.59	0.55	0.38	
No Children Living at Home	0.50	1.65	0.25	*
Birth Region				
Europe	0.13	1.13	0.44	
North America	0.00	1.00	0.50	
South America	0.73	2.07	0.49	
Other	0.96	2.60	0.57	
Citizenship				
Non-US Citizen, Permanent Resident	-0.03	0.97	0.28	
Non-US Citizen, Temporary Resident	-0.64	0.53	0.41	
Age				
35 and under	0.16	1.18	0.32	
55 and older	-1.41	0.25	0.50	**
<i>Employment Factors</i>				
Faculty Rank				
Associate Professor	-0.68	0.50	0.53	
Professor	-0.38	0.68	0.62	
Other	0.13	1.14	0.53	
Not Applicable	0.14	1.15	0.38	

Table 4.12 (continued)

Variable	Coeff.	OR	SE	Sig.
Tenure Status				
Tenured	0.65	1.91	0.62	
Not Tenure-Track	1.49	4.45	0.41	**
Not Applicable	1.40	4.06	0.44	**
Broad Job Field				
Computer and Mathematical Scientists	0.12	1.12	0.42	
Biological, Agricultural, and Other Life Scientists	-0.01	0.99	0.37	
Physical and Related Scientists	0.29	1.34	0.37	
Social and Related Scientists	0.55	1.73	0.39	
S&E Related Occupations	0.36	1.43	0.47	
Pension/Retirement Plan Available	-1.09	0.34	0.44	*
Profit-Sharing Plan Available	0.32	1.37	0.36	
Paid Vacation/Sick/Personal Days Available	-0.25	0.78	0.30	
Years at Current Job				
Less than 3	1.17	3.23	0.41	**
3 to 5	1.05	2.87	0.41	*
6 to 8	0.43	1.54	0.44	
<i>Organizational Visibility Factors</i>				
Work Not Supported by US government	-0.10	0.90	0.24	
Did Not Attend Professional Meeting Last Year	-0.99	0.37	0.42	*
Number of Professional Organization Memberships				
None	0.36	1.43	0.38	
3 to 4	0.07	1.07	0.27	
5 or more	0.13	1.14	0.42	
INSTITUTIONAL FACTORS				
Control (Private)	0.39	1.48	0.25	
R2: High research activity	-0.25	0.78	0.29	
Region				
Northeast	0.00	1.00	0.31	
Midwest	-0.07	0.93	0.29	
West	-0.56	0.57	0.34	

Note. OR = odds ratio.

** = $p < 0.01$, * = $p < 0.05$

perceived ease of movement and institutional factors.

Among perceived ease of movement factors, all significant predictors from Model 5 remained significant in the current model (Model 7) and no new factors became significant. Compared to faculty with no children living at home, those with children living at home had 65% greater odds of leaving their job (odds ratio = 1.65, $p < 0.05$) in Model 7, which was a decrease of 0.07 in the odds ratio found in Model 5. The odds of leaving increased slightly from Model 5 to Model 7 for faculty 55 and over compared to faculty age 36 to 54. In the final model, faculty age 55 and older had .75 lower odds of leaving their job than those ages 36 to 54 (odds ratio = 0.25, $p < 0.01$). Among tenure status factors, non-tenure-track faculty had nearly four and a half times greater odds of leaving than tenure-track faculty (odds ratio = 4.45, $p < 0.01$), while faculty with job where tenure status was not applicable had over four times greater odds of leaving than tenure-track faculty (odds ratio = 4.06, $p < 0.01$). Compared to Model 5, the odds for non-tenure-track faculty in Model 7 decreased and the odds for faculty in positions where tenure status was not applicable increased. Faculty in jobs where pension or retirement plans were available had lower odds of leaving than those in jobs without pension or retirement plans available (odds ratio 0.34, $p < 0.05$). This was the same odds ratio found in Model 5, however the significance level decreased from 0.01 in Model 5 to 0.05 in Model 7. Compared to faculty working nine or more years in their job, those working less than three years had over three times greater odds of leaving (odds ratio = 3.23, $p < 0.01$), which was higher odds than seen in Model 5 (odds ratio = 2.94). Additionally, faculty working three to five years in their job were almost three times more likely to leave their job than faculty who have been in their job for nine or more years (odds ratio = 2.87, $p < 0.05$). This was a decrease from the odds ratio and significance level found in Model 5 (odds ratio = 2.94). Faculty who did not attend a professional

organization meeting in the last year had 63% lower odds of leaving than those who attended a meeting (odds ratio = 0.37, $p < 0.05$). This was a one-point greater odds than what was found in Model 5 and the same level of significance. Similar to Model 5, no institutional factors were significant in predicting the decision of international S&E faculty to leave their job.

Summary

This chapter presented the results of the data analyses. The descriptive statistics summaries revealed that international S&E faculty in the sample were mostly Asian males from 36 to 54 years old who were naturalized US citizens in 2015. In their work roles, the majority were tenured professors in the engineering field who had been in their 2015 job for at least nine years. They can mainly be found working at R1 public universities in the South. Approximately 6% of the sample left their jobs between 2015 and 2017 with the majority of them remaining in higher education in the US. From the binary logistic regression analyses, this study found that ease of movement factors, specifically employment factors within this category, had the highest explanatory power in predicting the decision of faculty to leave. Of the perceived desirability of movement factors, dissatisfaction with job location and dissatisfaction with the overall job led to higher odds of leaving. Among perceived ease of movement factors, having no children living at home, working in a non-tenure-track or job where tenure track is not applicable, and working in the job for shorter amounts of time all had a positive effect on the odds of leaving. However, being over 55, having a pension or retirement plan available, and not attending a professional organization meeting in the last year all had a negative effect on the odds of leaving. The next chapter includes a discussion of these findings and implications for future research.

CHAPTER V

DISCUSSION AND CONCLUSION

Introduction

As US universities seek to increase their intellectual capital and compete with universities around the world, they have increasingly attracted talented international faculty in S&E (Marginson, 2006; JASON, 2019). These faculty benefit US institutions not only in areas of research and scholarship (Corley & Sabharwal, 2007; Kim et al., 2011; Levin & Stephan, 1999; Mamiseishvili, 2010; Mamiseishvili & Rosser, 2010; Webber, 2012; Webber & Yang, 2014), but also in diversity and internationalization of the campus (Foote, 2013; Lin et al., 2009; Skachkova, 2007). However, not all of these faculty choose to stay in their job, in fact, some choose to leave the US or academia entirely (Kim et al., 2012). Due to the large proportion international S&E faculty employed at US research universities and the high cost of replacement (Ehrenberg et al., 2003), it is important that US universities understand why these faculty leave and establish efforts to retain them. This study provided a description of who are international S&E faculty employed at US research universities, characteristics of the next job for those who leave, and investigated factors that predicted their decision to leave their job. These findings can aid US research universities and S&E departments in retaining international S&E faculty.

The purpose of this study was to gain a better understanding of international S&E faculty who leave US institutions for another position and their career path after departure. Six research questions guided this study:

RQ1. What are the descriptive statistics of international S&E faculty employed at US research universities?

- RQ2. Of international S&E faculty who leave their job, what are the characteristics of their next position?
- RQ3. What perceived desirability of movement factors (i.e. job satisfaction) predict international S&E faculty's decision to leave their job?
- RQ4. What perceived ease of movement factors (i.e. gender, race, marital status, having children, birth region, citizenship, age, faculty rank, tenure, job field, job benefits, employment length, government supported work, professional organizations) predict international S&E faculty's decision to leave their job?
- RQ5. What institutional factors (i.e. institutional control, Carnegie classification, region) predict international S&E faculty's decision to leave their job?
- RQ6. How do perceived desirability of movement, perceived ease of movement, and institutional factors influence international S&E faculty's decision to leave their job?

This chapter includes a summary and discussion of the findings as well as implications for both S&E departments and national policymakers. Finally, recommendations for future research are presented and the chapter ends with conclusions.

Discussion

Research Question 1: Discussion of International S&E Faculty Descriptive Statistics

To better understand international S&E faculty employed at US research universities, this study first analyzed the descriptive statistics of the sample. Compared to previous studies, some descriptors were similar, while others seemed to point to shifts in the make-up of international S&E faculty. However, some caution should be taken when exploring these differences since they may be a product of variation in how international or S&E is defined in the literature versus a true shift in the population.

Personal. This study found that 32% of the study sample were female. This is higher than what has been reported in previous studies, such as Webber (2013) who found that females were 14% of foreign-born S&E faculty and Corley and Sabharwal (2007) who found females were 20%. Since this is quite a large increase, it is possible that this indicates a shift in the gender make-up of international S&E faculty at US research universities. In their study of trend analysis over three decades, Kim et al. (2011) found that the percentage of international female graduates of all US doctorate programs has increased over the 1980s, 1990s, and 2000s. Since over half of all international S&E faculty in the US receive their doctorate from a US institution, it seems likely that the increase in female international doctorates has contributed to a higher percentage of female international S&E faculty in this study. This outcome may also be impacted by the finding that international female doctorates are more likely to remain in the US after graduation (Kim et al., 2011), which has also proven true specifically for international S&E doctorates (Roh, 2015).

In this study, most international S&E faculty were married (87%) with children living at home (58%), which is not surprising given that the majority were between the ages of 36 and 54. Consistent with Sabharwal's (2008) findings, this study also found most faculty were born in Asia (53%), followed by 22% born in Europe, 10% in North America, 10% in South America, and 6% in other regions. When examining citizenship at the time of the 2015 survey data collection, it was found that half of the sample were naturalized US citizens, followed by 40% US permanent residents, and 10% temporary residents. It is not surprising that many faculty have become US citizens or permanent residents since most have been in the US for some time. It is likely that if a faculty member plans to remain in the US, they will seek permanent residency status as quickly as possible since temporary residency through the H-1B visa is limited to six

years (USCIS, 2020) and temporary status can restrict access to certain types of research funds and complicate international travel for research or conferences (Foote, 2013).

Employment. In work roles, international S&E faculty were mostly tenured (49%) or tenure-track (22%) and held the position of professor (30%), assistant professor (28%), or associate professor (26%), which is consistent with other studies (Sabharwal, 2008; Webber, 2013). Additionally, it was not surprising to find that 24% of faculty were working as engineers, which has often been reported as the most common discipline among international S&E faculty (Stephen, 2012; Webber, 2013). When examining the availability of job benefits, it was found that international S&E faculty often had access to benefits with 97% of jobs providing a pension or retirement plan, 91% a profit-sharing plan, and 79% paid vacation, sick, or personal days. The study sample were most concentrated at R1, private institutions located in the South and had been working in their same position for over eight years.

Satisfaction. This study reported nine specific categories of job satisfaction (salary, benefits, job security, job location, opportunity for advancement, intellectual challenge, level of responsibility, degree of independence, and contribution to society) as well as overall job satisfaction. Over 90% of the sample were satisfied in the areas of benefits, intellectual challenge, level of responsibility, degree of independence, contribution to society, and the overall job. On the other hand, the lowest percentages of satisfied faculty were for salary with 73% satisfied, opportunity for advancement with 75% satisfied, job security with 84% satisfied, and job location with 86% satisfied. It is interesting that although international S&E faculty have been found to have lower levels of job satisfaction than their US peers (Corley & Sabharwal, 2007), this study found the majority of faculty were satisfied with many aspects of their job.

Leaving job. Approximately 6% of the international S&E faculty in this study left their job during the time period examined. At first glance, this leave rate seems quite low compared to Kim et al.'s (2012) finding that 18% of international faculty left their job, however, Kim et al.'s sample differed in that it included only tenure-track, international S&E faculty at all 4-year institutions. On the other hand, the present study included all international S&E faculty, regardless of tenure status, but limited the scope to only R1 and R2 research universities. Therefore, it is not possible to directly compare the two findings, but it is a point of interest. This study also reported differences in international S&E faculty who stayed in their job versus those who left by research institution type (R1 or R2), broad job field, and birth region. Approximately 6% of those employed at R1 institutions left their job while only 5% of those at R2 institutions left. The highest percentage of leavers by broad job field was seen for those in uncategorized S&E related occupations with 8% leaving, followed by 7% leaving within the physical and related scientist and the social and related scientists, 6% within biological, agricultural, and other life scientists, 5% within computer and mathematical scientists, and 4% within engineers. When analyzing percentage of leavers by birth region, faculty born in South America had the highest leave rate at 9%, followed by 6% for Europe and North America, and 5% for Asia. Faculty born in all other regions of the world had a 7% leave rate.

Research Question 2: Discussion of Next Position Descriptive Statistics

This study expanded upon previous literature by providing descriptive statistics of international S&E faculty who leave their position. Previous studies have not been able to collect data on international faculty who moved outside the US, therefore this study provides unique insight into the mobility of these faculty. Approximately 11% of international S&E faculty who left their job exited the US and of that group, 42% returned to their birth country and

58% moved to another foreign country. The retention of international S&E faculty is important not only to US research universities, but also the US economy. Faculty who remain in the US are still able to contribute to S&E research and help strengthen the US economy. It is interesting that over half of international S&E faculty who leave their job and the US do not return to their birth country. This may indicate that these faculty were given highly attractive offers in order to entice them to move to a third country, given that moving away may involve additional difficulties such as adjusting to a new academic culture (Gahungu, 2011) or navigating a new immigration system.

This study also found that among international S&E faculty who left their job, 32% found a new job outside of a higher education institution in either government or private industry sectors. This differs from Kim et al.'s (2012) study of foreign-born, pre-tenured international faculty in S&E which found that those faculty who left their job were significantly more likely to go to industry and leave academia entirely, however, their study did not include faculty who left the US. The difference in findings may point to a difference in the mobility of tenure-track versus all international S&E faculty or among those who remain in the US for their next position or exit the US. This study also found that 9% of those who left their job found a new position outside of the S&E field, which is concerning since these individuals are highly-trained in their field and represent a loss to the global S&E industry.

Research Question 3: Discussion of Perceived Desirability of Movement

This study confirmed the findings of previous literature that perceived desirability of movement factors (i.e. job satisfaction) significantly predicted the decision of international S&E faculty to leave their job (Bruce, 2011; Kim et al., 2012; Kim et al., 2013; Lawrence et al., 2014; Smart, 1990, Zhou & Volkwein, 2004). Specifically, higher odds of leaving were found for

faculty who were dissatisfied with their overall job, intellectual challenge of the job, and job location. On the other hand, dissatisfaction with salary, benefits, job security, opportunities for advancement, level of responsibility, degree of independence, and contribution to society were not found to be significant predictors of leaving. It is surprising that satisfaction with salary was not significant since this contradicts previous studies (Smart, 1990; Zhou & Volkwein, 2004). This may point to differences between general faculty populations and S&E or international faculty.

Satisfaction with overall job. This study found that international S&E faculty who were dissatisfied with their overall job had nearly three times greater odds of leaving their job than those who were satisfied, which was the highest odds among all significant perceived desirability of movement variables. This is consistent with previous studies of both US citizen and non-US citizen faculty that indicated career satisfaction impacted the decision to leave a job (Bruce, 2011; Kim et al., 2013; Smart, 1990). This finding is not surprising since it also aligns with the role of employee satisfaction in March and Simon's Theory of Organizational Equilibrium (1958), which states employees who reach a zero or lower on the inducement-contribution utility scale will begin searching for alternate employment options. In other words, employees who are not satisfied with their job will be searching for a new position.

Satisfaction with location. Second, this study found that international S&E faculty who were dissatisfied with their job location had 78% greater odds of leaving their job than those who were satisfied. Many international faculty have the option of not only working in the US, but also in their birth country, thus increasing the number of alternate options for employment. Organizational equilibrium theory would support that by international faculty having more options for employment location, they are also more likely to leave when they are dissatisfied

with their location. On the other hand, many US faculty do not have easy access to work authorization for other countries, therefore their alternative options are more limited.

Dissatisfaction with the job location is not unique to international faculty, however, foreign-born scientists have been found to be less satisfied than US faculty with their job location (Corley and Sabharwal, 2007), which may also relate to cultural adjustment issues experienced by international faculty living in the US (Collins, 2008; Foote, 2013). By coming to the US, international faculty are moving away from their known customs and culture which can be difficult and lead to feelings of isolation and loneliness, particularly if they are living in an area with a small international population. While there are areas of the US which are quite diverse, some locations may feel isolating to international faculty (Theobald, 2013). For example, nearly a fourth of international S&E faculty in this study were working for an institution in the Midwest, yet only 11% of immigrants in the US are concentrated in the Midwest (Budiman, Tamir, Mora, & Noe-Bustamante, 2020).

Satisfaction with intellectual challenge. International S&E faculty in this study who were dissatisfied with the intellectual challenge of their job had two times greater odds of leaving their job than those who were satisfied in this area. It is not surprising that these faculty seek and value challenging jobs where they are able to use their knowledge and skills. In fact, international S&E faculty are among the most productive faculty at US research universities with many studies having found that they are more productive researchers compared to their US peers (Corley & Sabharwal, 2007; Kim et al., 2011; Levin & Stephan, 1999; Mamiseishvili, 2010; Mamiseishvili & Rosser, 2010; Webber, 2012; Webber & Yang, 2014).

Research Question 4: Discussion of Perceived Ease of Movement Factors

This study found that perceived ease of movement factors significantly predicted the decision of international S&E faculty to leave their job. Of the three sub-groups in perceived ease of movement factors (personal, employment, and organizational visibility), employment factors played the largest role in predicting the odds of international S&E faculty leaving with tenure status, pension/retirement plan, and years in the job being significant. On the other hand, organizational visibility factors contributed only a small portion to the outcome and only professional meeting attendance was significant within this sub-category. Personal factors were moderately important in predicting the decision of international S&E faculty to leave their job with children living at home and faculty age being significant predictors.

It is interesting that citizenship was not found to be significant. Faculty first starting work in US higher education are likely beginning in H-1B temporary residency status (Stephen, 2012). It would be assumed that these faculty would leave more often than others since the work authorization they obtained would require that they do not remain permanently in the US. However, faculty in temporary residency may also be restricted in movement due to the work authorization being tied to their employer. These competing forces may balance out the movement in this category, which is why it was not found to be significant.

Children living at home. Among personal factors, this study found that international S&E faculty with no children living at home had greater odds of leaving their job than those with children at home. This finding is not surprising given that S&E faculty positions are highly specialized and changing to a new position would often result in relocating, lowering the perceived ease of movement. It follows that international faculty with children have to consider the additional difficulty of changing cities and schools for any children living in the home.

However, Xu (2008) found that family responsibility, which included marital status and number of dependents, did not impact the intention to leave for tenured and tenure-track STEM faculty, regardless of international status. Perhaps international S&E faculty are different from US faculty in how having children in the home impacts the decision to leave.

Age. Age was another personal factor which also significantly predicted the odds of international S&E faculty leaving their job. This study found that international S&E faculty 55 and older had lower odds of leaving than those age 36 – 54. The only similar study to consider age was Smart (1990), which found that younger faculty were more likely to intend to leave their job. The present study supports Smart's findings that younger faculty are more mobile. Although it should be noted that no differences in the decision to leave were found between the youngest age group, less than 36, and the middle age group, 36 – 54.

Years in job. Related to age, the number of years working in the same job was one of the employment factors examined in this study. The number of years working in the same job was significant in predicting the decision of international S&E faculty to leave their job. In fact, both faculty who worked in their job for less than three years and those who worked in their job for three to five years had nearly three times greater odds of leaving than faculty who had worked in their job for more than eight years. This finding may be connected with the lower odds of older international S&E faculty leaving their job, since they may have also been working in the same position for many years. Additionally, this study confirms previous studies of faculty departure finding that longer time spent in a career reduced the intent the leave (Smart, 1990; Zhou & Volkwein, 2004).

Tenure status. Also among employment factors, having a job that was not tenure-track or where tenure was not applicable resulted in higher odds of international S&E faculty leaving

their job than those on tenure-track. In fact, the odds of leaving for these faculty was the highest among all perceived ease of movement factors. It is not surprising that international S&E faculty would seek positions that are working towards tenure status. Achieving tenure status brings many benefits, such as the protection of academic freedom and additional job security, which has been found to reduce turnover (Finkin, 1996). Since a difference was not found in the odds of leaving between tenure-track and tenured faculty in this study, it follows that even though tenure-track faculty are not in tenure status yet, the opportunity to achieve tenure status is attractive enough to retain these faculty at the same rate as tenured faculty. This is somewhat contradictory to Zhou and Volkwein's (2004) study which found that nontenured faculty had stronger intentions of leaving than tenured faculty, although they did not distinguish between faculty on tenure-track and those not on tenure-track.

Pension/Retirement plan. Availability of a pension or retirement plan was the final employment factor considered. International S&E faculty who reported having a pension or retirement plan available through their job, whether they participated or not, had lower odds of leaving compared to faculty in positions without this benefit. This partially contradicts Zhou and Volkwein's (2004) finding that employee benefits did not impact the intention of faculty to leave, regardless of international or tenure status. However, the present study did align with Zhou and Volkwein in that other benefits, specifically availability of a profit-sharing plan or paid vacation/sick/personal days, did not predict international S&E faculty leaving their job. It is reasonable to conclude that these faculty are participating in the available retirement plans and leaving would negatively impact the benefits received upon retirement, which would explain why these faculty have lower odds of leaving.

Professional meeting attendance. When only organizational visibility factors were considered, no factors were found to predict the decision of international S&E faculty to leave their job. However, when controlling for personal and employment factors, this study found that international S&E faculty who did not attend a meeting for a professional organization in the previous year had lower odds of leaving than faculty who attended a professional organization meeting. This is not surprising since Organizational Equilibrium Theory states that the visibility of extraorganizational opportunities will increase the individual's ease of movement (March & Simon, 1958). Thus, international S&E faculty who attend a professional meeting would likely learn of other employment opportunities, even without actively seeking them out. This may be enough to pique the interest of the faculty who would then compare alternate employment options with their own position. At the same time, attending a professional organization meeting also increases the visibility of the faculty to other universities who may seek to recruit that person for their department.

Research Question 5: Discussion of Institutional Factors

This study found that no institutional factors significantly predicted the decision of international S&E faculty to leave their job. This is consistent with Kim et al.'s (2013) finding that institutional control and Carnegie classification did not significantly discriminate intent to leave, stay, or be undecided among pre-tenure faculty. However, Zhou and Volkwein (2004) found that institutional characteristics had a small, indirect effect on intent to leave among tenured faculty. One reason institutional factors were not significant in the present study could be that the scope of the study was already narrowly defined to only institutions classified as Carnegie R1: very high research activity and R2: high research activity.

Research Question 6: Discussion of Combined Perceived Desirability of Movement, Perceived Ease of Movement, and Institutional Factors

This study found that while perceived desirability of movement factors and perceived ease of movement factors were both significant in predicting the decision of international S&E faculty to leave their job, institutional factors were not found to be significant. Ease of movement factors had the greatest explanatory power of the decision to leave (pseudo- $R^2 = .15$) with perceived desirability of movement factors explaining a smaller portion (pseudo- $R^2 = .06$). As described in Organizational Equilibrium Theory, the decision is impacted not only by perceived desirability of movement or satisfaction factors, but also by perceived ease of movement factors (March & Simon, 1958). Among ease of movement factors, the sub-category of employment factors by far had the highest impact on predicting turnover followed by personal factors and organizational visibility factors. In other words, employment factors were the most impactful category of variables in predicting the decision of international S&E faculty to leave their job.

Additionally, once all three categories of factors were entered in the final model, the significance of some factors in predicting the decision of international S&E faculty leaving their job changed. Among perceived desirability of movement variables, the odds of leaving increased for faculty dissatisfied with their job location and their overall job. On the other hand, dissatisfaction with intellectual challenge was no longer significant after controlling for perceived ease of movement and institutional factors. It seems reasonable to conclude that employment factors such as faculty rank and tenure status mediated the relationship between dissatisfaction with intellectual challenge and the odds of leaving a job, which caused this finding to no longer be significant. Among perceived ease of movement factors, the odds of

leaving increased for international S&E faculty who were 55 and older, in positions where tenure status was not applicable, worked less than three years in their job, and did not attend a professional organization meeting in the previous year. Odds of leaving decreased for international S&E faculty with no children at home, not on tenure-track, and who worked in their job for three to five years while the odds remained the same for faculty with retirement/pension plans available.

Implications

The results of this study add to the existing literature on turnover of international S&E faculty and highlights the importance of retaining international faculty if the US wishes to compete in the global knowledge-economy. International S&E faculty contribute significantly to the diversity and internationalization goals of US research universities and are highly productive researchers, in fact, more productive than their US peers (Corley & Sabharwal, 2007; Kim et al., 2011; Levin & Stephan, 1999; Mamiseishvili, 2010; Mamiseishvili & Rosser, 2010; Webber, 2012; Webber & Yang, 2014). To retain more international S&E faculty changes must be made at the departmental level and at the national level.

Implications for S&E Departments

The findings of this study highlight the importance of employment factors in the decision of international S&E faculty to leave their job. This implies that some of the changes that should be made to retain these faculty are at the departmental level, residing within the power of department heads and deans to implement. Of all factors in this study, the highest odds of leaving were found for faculty not in tenure or tenure-track positions, therefore, S&E departments must hire more international faculty into tenure-track positions. This would result in the largest difference in retention of international S&E faculty. If departments are not able to

create more tenure-track positions, they should be prepared for higher turnover among those faculty as they seek opportunities with the possibility of tenure.

This study also found higher odds of departure for international S&E faculty who were in the first years of their job, dissatisfied with the location of their job, or dissatisfied with their job overall. These findings seem to align with research which shows that international faculty experience difficulty adjusting to US culture and academic culture as well express feelings of isolation and loneliness (Collins, 2008; Gahungu, 2011). International faculty also report lower satisfaction with their work due to difficulty relating to colleagues and forming relationships (Kim et al., 2012). In addition, international faculty are often navigating difficult and confusing immigration processes early in their career which may cause additional stress (Foote, 2013).

To support the adjustment of international S&E faculty, particularly those early in their career, a two-prong approach should be undertaken by S&E departments. First, department heads and deans should participate in professional development aimed at creating a better understanding of difficulties faced by international faculty and how departments can best support these faculty. If this training does not already exist at the university, the international office of the university should be asked to assist in creating this type of training for departments. The training should address the challenges faced by international faculty and how departments can aid international faculty in navigating these challenges. For example, training could provide a general overview of US immigration and visa processing, not so that the departments can advise international faculty, but so they will better understand how difficulties with immigration processes may impact international faculty's work or ability to travel for conferences (Collins, 2008; Foote, 2013). The training should also include cultural competency and intercultural communication strategies to aid departments in understanding cultural differences,

communicating effectively, and building relationships with international faculty. It is important that this type of training take place in S&E departments on an ongoing basis for department heads and deans with some trainings extended to all faculty in the department, when appropriate. Department heads and deans should then use this training to inform how they welcome and assist new international faculty in their early years at the institution. Department chairs should check-in on a regular basis with new international S&E faculty to provide guidance or clarification, which is especially important since the department chair is highly influential in an early-career faculty member's progress (Theobald, 2013).

The second prong of this approach is for S&E departments to implement a faculty mentor program which connects early-career faculty to senior faculty in the same department. Faculty mentor programs have been found to benefit faculty in their research productivity, career progression, navigation of academic culture, and sense of support and community (Boice, 1990; Johnson, 2007; Santo et al., 2009). Departments should offer this program to the entire faculty, not just international faculty, but special focus must be given to international faculty to ensure the program aids in their cultural and workplace adjustment. Faculty mentors should receive training similar to department heads and deans on the issues international faculty face and how the mentor can best support international faculty. Due to international faculty's lack of knowledge of US academic culture, mentors should offer guidance on expectations of US academia, tenure process, research, and teaching as well as provide advice on personal matters related to living in a new city, such as selecting a school for children or cultural organizations in the community related to the international faculty's home country. To ensure the success of such a program, it is vital that department heads set the expectation of participation in the program and continually emphasize the importance of the mentor/mentee relationship.

Rather than pairing international faculty with a mentor without input, the international faculty should be encouraged to meet with several potential mentors and select the person they feel would be the best fit. This method of pairing has been found to create the most successful mentoring relationships (Boice, 2000). Additionally, some programs have found it beneficial to temporarily pair a new faculty with a mentor during their first semester, then allow them to select a permanent mentor the following semester (Sorcinelli, Gray, & Birch., 2011). Adopting this model would allow the new international faculty to receive support during the difficult transition to starting the job, especially as they navigate their visa application and employment paperwork, but still allow the mentee to select the mentor who is best suited to the role at a later point. Departments should also encourage early career international faculty to network amongst their peers to reduce feelings of isolation and create a local support network (Collins, 2008; Solem & Foote, 2004).

While creation of more tenure-track positions, training of department heads and deans, and creation of a mentor program are recommended steps which S&E departments can take to retain more international S&E faculty, it is important to note that each institution should also be taking an active role in monitoring international faculty departures and addressing issues which may have caused their departure. Some additional factors affecting turnover may emerge for specific institutions or institution types. Surveying or conducting exit interviews for international S&E faculty leaving the institution may provide insight into further actions S&E departments can take to retain more international faculty.

National Policy Implications

For many years, US universities have been regarded as the top in the world with little competition from other nations in attracting international students. However, recently there has

been a shift in international student mobility such that US universities are no longer the clear winners in attracting global talent (Anderson & Svruga, 2018). In fact, over the past three years, annual enrollment of new international students at US universities has decreased (NAFSA, 2020c). This is alarming since the US has come to rely heavily upon these international students to meet demand for S&E workers in both industry and academia (JASON, 2019). The top reasons that international students cite for not enrolling at US universities are difficulties with the visa application process and an unwelcoming social and political environment (NAFSA, 2020c). While other countries have established national policies to attract more international students, such as Australia extending the amount of time a graduate is eligible for post-study work, the US has placed more restrictions on international student visas under the Trump administration, creating additional barriers to studying in the US. For example, in March 2017 a presidential memorandum called for heightened screening and vetting of visa applications which has resulted in delays in processing of student visas (NAFSA, 2019). By 2019, some processing times had reached “crisis level” taking up to 15 months to process an extension of foreign student status. More recently, a proposed rule would limit the amount of time an international student is admitted to the US for study (duration of status) to four years at most, rather than the current policy which allows a student to remain for the entirety of their program of study (NAFSA, 2020d). Any student taking longer than the approved time would have to apply for an extension of stay, which is not guaranteed to be granted.

To strengthen enrollment of international students in US doctoral programs and thus the supply of international S&E faculty, US policymakers should adopt student visa policies which decrease delays in processing and encourage, rather than discourage, international students to study in the US. The current proposed rule to eliminate duration of status is especially

concerning for doctoral students since most of these students would expect to take more than four years to finish their degree. Only allowing these students to receive initial approval for four years of study creates uncertainty as to whether they will be allowed to finish their degree and may disincentivize them to study in the US. Additionally, processing time for visa applications needs to be decreased to ease the bureaucratic burden for students to receive approval to study in the US. Finally, experiential learning opportunities after graduation through Optional Practical Training (OPT) and the current extension of OPT available to STEM graduates needs to be maintained. OPT and the STEM extension has been key in attracting talented students in S&E and has provided an easier pathway to employment at US research universities. Decreasing the allowable time period for OPT would further adversely affect enrollment of new international students.

Another national policy which affects international S&E faculty is the H-1B visa program, which is a non-immigrant visa commonly used to obtain work authorization for international faculty at US research universities. This visa has been especially helpful in recruiting talent from abroad to work in academia since universities have been exempt from H-1B visa caps for specialty occupations, such as faculty positions (Stephen, 2012). However, recent policy changes under the Trump administration has placed additional barriers to obtaining and renewing H-1B visas. In 2017, the US Citizenship and Immigration Services released a policy memorandum which withdrew the deference policy for individuals applying for an extension of their H-1B visa (NAFSA, 2020c). Prior to this memorandum, adjudicators of H-1B extension petitions were directed to defer to prior determinations of eligibility for the visa as long as the parties involved and the facts remained the same. Withdrawing this policy has led to an increase in denial of extensions, even when submission materials remained the same as the

initial visa application, and disruption of employment plans as requests for further evidence have delayed many renewals.

In response to the COVID-19 Pandemic in 2020, the Trump administration announced additional changes to H-1B visas as it seeks to limit these visas and promote jobs for US citizens, as addressed in the Presidential Executive Order on Buy American and Hire American (NAFSA, 2020b). First in June 2020, new H-1B visas were suspended through the end of the year, including those for international faculty (Suspension of Entry of Immigrants and Nonimmigrants, 2020). Then in October 2020, the Department of Homeland Security published an interim final rule effective in early December which would narrow the definition of specialty occupation and require a specialized degree that closely matches the job for H-1B visas (Redden, 2020). Soon after, the Department of Labor published an interim final rule effective immediately that changed how wage rates were calculated when determining prevailing wage, or the minimum salaries required for persons applying for H-1B visas (NAFSA, 2020a). This change has resulted in significantly higher wage requirements, which will likely result in the inability of universities to renew H-1B visas for some international faculty and price out recent graduates from the market (Redden, 2020). These two most recent H-1B visa changes are expected to decrease H-1B petitions by one-third according to the Department of Homeland Security.

These changes to the H-1B visa will negatively impact the ability of US research universities to attract and retain talented international S&E faculty and, in combination with the decrease in new enrollments of international students at US institutions, points to a potential future shortage of S&E faculty in the US. A shortage of international S&E faculty will not only impact the research they currently engage in, but also limit the student enrollments of S&E programs at US universities. Without enough qualified faculty to teach students, the supply of

S&E graduates will decrease further. This not only hurts higher education, but also the US economy, which is dependent upon highly skilled individuals to work in S&E (JASON, 2019). Therefore, it is increasingly important that US policymakers reverse these recent changes to the H-1B visa program. This will allow US research universities to hire talented international faculty and retain the ones who are already employed in the US contributing to US research agendas, teaching S&E students, and helping the US to maintain its preeminent positions in S&E.

Recommendations for Future Research

The findings of this study present several opportunities for future research of international S&E faculty turnover. First, future studies should also include international S&E faculty who were educated outside the US. While the use of a large dataset in this study allowed a relatively large sample size to be analyzed, it excluded international S&E faculty who completed their doctorate outside the US. Since these faculty would likely have spent their formative years in another country, they may experience additional cultural barriers adjusting to living and working in the US. Additionally, international faculty who graduate from US doctorate programs also have the advantage of exposure to US academia so that by the time they become faculty, they have at least a basic understanding of US university culture and expectations. It follows that different factors may predict foreign-educated international faculty's decision to leave a job compared to their US-educated peers. A future study could also conduct qualitative interviews to learn more about why international S&E faculty leave. This type of study could gather more in-depth information and provide additional recommendations for how S&E departments can best support international faculty.

Additionally, future studies may expand upon the limited variables in this study to determine other factors that affect the decision of international S&E faculty to leave their job. For example, beyond salary and basic healthcare and retirement benefits, S&E faculty are also rewarded with a share of profits and royalties received from university-owned patents created by their research (Lieberwitz, 2007). This study did not examine how this and other areas of personal profitability from the commercialization of research may impact the decision to leave a job. Another study could include factors that may pull international S&E faculty to leave their job. This study focused mainly on factors which pushed faculty from their position, but there are other factors such as salary, research funding, or proximity to family that could pull faculty to a new position. Similarly, this study assumed all international S&E faculty in the sample were equally valuable to universities. A future study could include measurements of faculty productivity, reputations in their field, or employment in a prestigious department or university to determine how these factors impact the decision to leave. It could also be determined if there are differences in the factors predicting the decision to leave based upon the quality of the faculty themselves.

Finally, future studies should further explore international S&E faculty's career path after departure. This study provided initial descriptive statistics that helped describe the post-departure career path of these faculty, however, in-depth analysis was limited due to a relatively small sample of faculty who left their jobs. Future studies could expand the time period examined so that a higher number of departures would be captured. This would allow for more in-depth analysis based on variations in the post-departure career path. For example, further study of international S&E faculty who leave the US for their next job may provide specific factors affecting this group's decision to leave, which could inform US national policies.

Conclusion

This study sought to gain a better understanding of international S&E faculty who leave US institutions for another position and their career path after departure through descriptive statistics and binary logistic regression analyses. Of the sample, most international S&E faculty were middle age, Asian males who had become naturalized US citizens and worked as tenured faculty members in the engineering field. Six percent left their job and the majority found a new position in US higher education. Ease of movement factors, specifically employment factors, played the largest role in explaining the decision of international S&E faculty to leave their job, while desirability of movement factors also contributed to the decision. Based upon the findings, supporting international S&E faculty through faculty mentor programs is recommended as way to retain more of these faculty as well as hiring more international S&E faculty into tenure-track positions. In addition, US policymakers should seek to attract talented individuals in S&E by implementing immigration policies which encourage international students and S&E faculty to study and work in the US. Future studies can further explore the reasons why international S&E faculty choose to leave their position and include international faculty who were educated outside the US. If the US wishes to maintain its high ranking among world universities, effort needs to be taken to retain more highly qualified international S&E faculty at US research universities.

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APPENDICES

Appendix A
2013 Survey of Earned Doctorates



SED
Survey of Earned Doctorates
July 1, 2013 to June 30, 2014

Conducted by
NORC
at the UNIVERSITY of CHICAGO



Please complete:

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<small>First Name</small>	<small>Middle Name</small>	<small>Last Name</small>	<small>Suffix (e.g., Jr.)</small>
<input type="text"/>			<input type="text"/>
<small>Cross Reference: Birth name or former name (if changed)</small>			<small>Today's Date</small>
<input type="text"/>		<input type="text"/>	
<small>Doctoral Institution</small>		<small>City or Branch</small>	
<input type="text"/>			<input type="text"/>
<small>Type of Research Doctoral Degree (e.g., Ph.D., Ed.D., etc.)</small>			<small>Date Degree Granted (mm/yyyy)</small>

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended. All information you provide is protected under the NSF Act and the Privacy Act of 1974, and will be used only for research or statistical purposes by your doctoral institution, the survey sponsors, their contractors and collaborating researchers for the purpose of analyzing data, preparing scientific reports and articles and selecting samples for a limited number of carefully defined follow-up studies. The last four digits of your Social Security Number are also solicited under the NSF Act of 1950, as amended; provision of it is voluntary. It will be kept confidential. It is used for quality control, to assure that we identify the correct persons, especially when data are used for statistical purposes in Federal program evaluation. Any information publicly released (such as statistical summaries) will be in a form that does not personally identify you or other respondents. Your response is voluntary and failure to provide some or all of the requested information will not in any way adversely affect you.

The time needed to complete this form varies according to individual circumstances, but the average time is estimated to be 20 minutes. If you have comments regarding this time estimate, you may write to the National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230, Attention: NSF Reports Clearance Officer. A Federal agency may not conduct or sponsor a collection of information unless it displays a currently valid OMB control number.

For more information about the Survey of Earned Doctorates, go to www.sedsurvey.org

Part A - EDUCATION

INSTRUCTIONS: Please PRINT your name on the front cover. Please print all responses; you may use either a pen or a pencil.

A1. What is the title of your dissertation?

Please mark (X) this box if the title below refers to a performance, project report or musical or literary composition required instead of a dissertation.

_____ Title

A2. Please write the name of the primary field of your dissertation research.

_____ Name of Field

Using the list on pages 6-7, choose the code that best describes the primary field of your dissertation research.

Number of Field

If your dissertation research was interdisciplinary, list the name and number of your secondary field.

Please mark (X) this box if your dissertation was not interdisciplinary. Go to A3.

_____ Name of Field

Number of Field

If there were more than two fields, please list these additional fields.

_____ Name of Field

Number of Field

_____ Name of Field

Number of Field

A3. Please name the department (or interdisciplinary committee, center, institute, etc.) of the university that supervised your doctoral studies.

Department/Committee/Center/Institute/Program

A4. Did you receive full or partial tuition remission (waiver) for your doctoral studies?

Mark (X) one

- 1 No, I did not receive any tuition remission
- 2 Yes, I received less than 1/3 of tuition
- 3 Yes, I received between 1/3 and 2/3 of tuition
- 4 Yes, I received more than 2/3 of tuition, but less than full
- 5 Yes, I received full tuition remission

A5. Please indicate whether each of the following was a source of financial support during graduate school.

Mark (X) Yes or No for each

	Yes	No
a Fellowship, scholarship	<input type="checkbox"/>	<input type="checkbox"/>
b Grant	<input type="checkbox"/>	<input type="checkbox"/>
c Teaching assistantship	<input type="checkbox"/>	<input type="checkbox"/>
d Research assistantship	<input type="checkbox"/>	<input type="checkbox"/>
e Other assistantship	<input type="checkbox"/>	<input type="checkbox"/>
f Traineeship	<input type="checkbox"/>	<input type="checkbox"/>
g Internship, clinical residency	<input type="checkbox"/>	<input type="checkbox"/>
h Loans (from any source)	<input type="checkbox"/>	<input type="checkbox"/>
i Personal savings	<input type="checkbox"/>	<input type="checkbox"/>
j Personal earnings during graduate school (other than sources listed above)	<input type="checkbox"/>	<input type="checkbox"/>
k Spouse's, partner's, or family's earnings or savings	<input type="checkbox"/>	<input type="checkbox"/>
l Employer reimbursement/assistance	<input type="checkbox"/>	<input type="checkbox"/>
m Foreign (non-U.S.) support	<input type="checkbox"/>	<input type="checkbox"/>
n Other - Specify	<input type="checkbox"/>	<input type="checkbox"/>

A6. Which TWO sources listed in A5 provided the most support?

Enter **letters** of primary and secondary sources

- 1 Primary source of support
- 2 Secondary source of support Mark (X) if no secondary source

A7. When you receive your doctoral degree, how much money will you owe that is directly related to your undergraduate and graduate education?

Mark (X) one in each column

a UNDERGRADUATE	b GRADUATE
1 <input type="checkbox"/> None	1 <input type="checkbox"/> None
2 <input type="checkbox"/> \$10,000 or less	2 <input type="checkbox"/> \$10,000 or less
3 <input type="checkbox"/> \$10,001 - \$20,000	3 <input type="checkbox"/> \$10,001 - \$20,000
4 <input type="checkbox"/> \$20,001 - \$30,000	4 <input type="checkbox"/> \$20,001 - \$30,000
5 <input type="checkbox"/> \$30,001 - \$40,000	5 <input type="checkbox"/> \$30,001 - \$40,000
6 <input type="checkbox"/> \$40,001 - \$50,000	6 <input type="checkbox"/> \$40,001 - \$50,000
7 <input type="checkbox"/> \$50,001 - \$60,000	7 <input type="checkbox"/> \$50,001 - \$60,000
8 <input type="checkbox"/> \$60,001 - \$70,000	8 <input type="checkbox"/> \$60,001 - \$70,000
9 <input type="checkbox"/> \$70,001 - \$80,000	9 <input type="checkbox"/> \$70,001 - \$80,000
10 <input type="checkbox"/> \$80,001 - \$90,000	10 <input type="checkbox"/> \$80,001 - \$90,000
11 <input type="checkbox"/> \$90,001 or more	11 <input type="checkbox"/> \$90,001 or more

11 Please specify \$ _____

11 Please specify \$ _____

A8. The next few questions ask about the degrees you have received. Please provide the following information for this doctoral degree, your most recent master's degree and your first bachelor's degree in the appropriate columns below.

	This research doctoral degree	Most recent master's degree (e.g., MS, MA, MBA) or equivalent	First bachelor's degree (e.g., BA, BS, AB) or equivalent
a. Have you received a degree of this type?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
b. Month/year degree <u>granted</u>	<input type="checkbox"/> <input type="checkbox"/> Month <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Year	<input type="checkbox"/> <input type="checkbox"/> Month <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Year	<input type="checkbox"/> <input type="checkbox"/> Month <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Year
c. Month/year that you <u>started</u> your degree	<input type="checkbox"/> <input type="checkbox"/> Month <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Year	<input type="checkbox"/> <input type="checkbox"/> Month <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Year	<input type="checkbox"/> <input type="checkbox"/> Month <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Year
d. Primary field of study	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
e. Field number from list on pp. 6-7	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
f. Institution name	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
g. Branch or city	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
h. State or province	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
i. Country	USA	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>

A9. Excluding those above, have you attained any additional postsecondary degrees?

Yes No

If yes, please list the additional degree(s), granting institution(s), and years.

First Additional Degree

Degree type _____
 Degree field _____
 Field number, pp. 6-7 _____
 Month/Year granted _____
 Institution _____
 Branch or city _____
 State or country _____

Second Additional Degree

Degree type _____
 Degree field _____
 Field number, pp. 6-7 _____
 Month/Year granted _____
 Institution _____
 Branch or city _____
 State or country _____

If there are more than two degrees, additional degrees should be reported on the back cover.

A10. Was a master's degree a prerequisite for admission to your doctoral program?

Yes No

A11. In what month and year did you first enter any graduate school in any program or capacity?

Month
 Year

A12. How many years were you:
a. taking courses or preparing for exams for this doctoral degree (including a master's degree, if that was part of your doctoral program)?

Years (round to whole years)

b. working on your dissertation after coursework and exams (non-course related preparation and research, writing and defense)?

Years (round to whole years)

A13. Was there any time from the year you entered your doctoral program and the award of your doctorate that you were not working on your degree (that is, not taking courses or working on your dissertation)?

Yes No

If yes, how many years were you not working on your degree?

Years (round to whole years)

A14. Did you earn college credit from a community or two-year college?

1 Yes 2 No

A15. Are you earning, or have you earned, an MD or a DDS?

a ARE EARNING? b HAVE EARNED?

MD Yes No Yes No
DDS Yes No Yes No

Part B - POSTGRADUATION PLANS

B1. In what country or state do you intend to live after graduation (within the next year)?

1 in U.S. → State or territory
 2 not in U.S. → Country

B2. Do you intend to take a "postdoc" position?

(A "postdoc" is a temporary position primarily for gaining additional education and training in research, usually awarded in academe, industry, government, or a non-profit organization.)

1 Yes 2 No

B3. What is the status of your postgraduate plans (in the next year)?

Mark (X) one

1 Returning to, or continuing in, predoctoral employment → **GO TO B4**
 2 Have signed contract or made definite commitment for a "postdoc" or other work → **GO TO B4**
 3 Negotiating with one or more specific organizations
 4 Seeking position but have no specific prospects
 5 Other full-time degree program (e.g., MD, DDS, JD, MBA, etc.)
 6 Do not plan to work or study (e.g., family commitments, etc.) → **SKIP TO C1, P.10**
 7 Other - Specify

B4. What best describes your postgraduate plans (within the next year)?

Mark (X) one

1 "Postdoc" or further training → **GO TO B4a**
 2 Employment → **GO TO B4b**

B4a. What best describes the nature of your further training or study?

Mark (X) one

1 "Postdoc" fellowship → **GO TO B5**
 2 "Postdoc" research associateship
 3 Traineeship
 4 Internship, clinical residency
 5 Other Training - Specify

B4b. What best describes the nature of your employment?

Mark (X) one

1 Employment (other than military service) → **SKIP TO B6**
 2 Military service
 3 Other Employment - Specify

Section B continues on Page 9.



Please turn this page for the Field of Study List

The Field of Study listing on pages 6 and 7 is to be used in responding to items A2, A8, and A9. Please choose the code that best describes the name of your field.

BUSINESS MANAGEMENT/ADMINISTRATION

900 Accounting	912 Hospitality, Food Service & Tourism Management	935 Organizational Behavior (see also PSYCHOLOGY/Industrial & Organizational)
910 Business Administration & Management	916 International Business/Trade/Commerce	938 Business Management/Administration, General
915 Business/Managerial Economics	920 Marketing Management & Research	939 Business Management/Administration, Other
901 Finance	917 Management Information Systems/Business Statistics	
921 Human Resources Development	930 Operations Research (also in ENGINEERING & in MATHEMATICS)	

COMMUNICATION

940 Communication Research	950 Film, Radio, TV & Digital Communication	958 Communication, General
957 Communication Theory	947 Mass Communication/Media Studies	959 Communication, Other

COMPUTER & INFORMATION SCIENCES

400 Computer Science	410 Information Science & Systems	418 Computer & Information Sciences, General
	415 Robotics	419 Computer & Information Sciences, Other

EDUCATION**RESEARCH & ADMINISTRATION**

840 Counseling Education/Counseling & Guidance	810 Educational/Instructional Media Design	845 Higher Education/Evaluation & Research
800 Curriculum & Instruction	812 Educational/Instructional Technology	833 International Education
805 Educational Administration & Supervision	807 Educational Leadership	825 School Psychology (also in PSYCHOLOGY)
820 Educational Assessment/Testing/Measurement	822 Educational Psychology (also in PSYCHOLOGY)	830 Social/Philosophical Foundations of Education
804 Educational & Human Resource Studies/Development	808 Educational Policy Analysis	835 Special Education
	815 Educational Statistics/Research Methods	806 Urban Education and Leadership

TEACHER EDUCATION

858 Adult & Continuing Teacher Education	850 Pre-elementary/Early Childhood Teacher Education	856 Secondary Teacher Education
852 Elementary Teacher Education		

TEACHING FIELDS

860 Agricultural Education	870 Family & Consumer/Human Science (also in Fields Not Elsewhere Classified)	876 Music Education
861 Art Education		878 Nursing Education
865 Bilingual & Multilingual Education	866 Foreign Languages Education	880 Physical Education & Coaching
864 English Education	868 Health Education	884 Science Education
863 English as a Second or Foreign Language	882 Literacy & Reading Education	885 Social Science Education
	874 Mathematics Education	889 Teacher Education & Professional Development, Other

OTHER EDUCATION

895 Workforce Education and Development	898 Education, General	899 Education, Other
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ENGINEERING

300 Aerospace, Aeronautical & Astronautical Engineering	330 Engineering Physics	363 Operations Research (also in MATHEMATICS & in BUSINESS MANAGEMENT)
303 Agricultural Engineering	333 Engineering Science	366 Petroleum Engineering
306 Bioengineering & Biomedical Engineering	336 Environmental/Environmental Health Engineering	369 Polymer & Plastics Engineering
312 Chemical Engineering	337 Geotechnical & Geoenvironmental Engineering	316 Structural Engineering
315 Civil Engineering	339 Industrial & Manufacturing Engineering	372 Systems Engineering
318 Communications Engineering	342 Materials Science Engineering	373 Transportation & Highway Engineering
321 Computer Engineering	345 Mechanical Engineering	398 Engineering, General
324 Electrical, Electronics & Communications Engineering	348 Metallurgical Engineering	399 Engineering, Other
376 Engineering Management & Administration	357 Nuclear Engineering	
327 Engineering Mechanics	360 Ocean Engineering	

HUMANITIES**HISTORY**

706 African History	705 European History	708 Middle/Near East Studies
700 American History (U.S. & Canada)	710 History, Science & Technology & Society	718 History, General
703 Asian History	707 Latin American History	719 History, Other

FOREIGN LANGUAGES & LITERATURE

768 Arabic	743 German	752 Russian
758 Chinese	746 Italian	749 Spanish
740 French	762 Japanese	769 Other Languages & Literature
	750 Latin American	

LETTERS

732 American Literature (U.S. & Canada)	734 English Language	736 Speech & Rhetorical Studies
720 Classics	733 English Literature (British & Commonwealth)	738 Letters, General
723 Comparative Literature	724 Folklore	739 Letters, Other
735 Creative Writing	737 Rhetoric & Composition	

OTHER HUMANITIES

770 American/U.S. Studies	778 Film/Cinema/Video Studies	788 Musicology/Ethnomusicology
773 Archaeology	777 Jewish/Judaic Studies & History	789 Music, Other
776 Art History/Criticism/Conservation	780 Music	785 Philosophy
792 Bible/Biblical Studies	786 Music Theory & Composition	790 Religion/Religious Studies
795 Drama/Theater Arts	787 Music Performance	798 Humanities, General
784 Ethics		799 Humanities, Other

LIFE SCIENCES**AGRICULTURAL SCIENCES/NATURAL RESOURCES**

000 Agricultural Economics	043 Food Science	030 Plant Pathology/Phytopathology (also in BIOLOGICAL SCIENCES)
025 Agricultural & Horticultural Plant Breeding	044 Food Science & Technology, Other	039 Plant Sciences, Other
020 Agronomy & Crop Science	066 Forest Sciences & Biology	046 Soil Chemistry/Microbiology
010 Animal Nutrition	070 Forest/Resources Management	049 Soil Sciences, Other
014 Animal Science, Poultry (or Avian)	079 Forestry & Related Science, Other	080 Wildlife/Range Management
019 Animal Science, Other	050 Horticulture Science	072 Wood Science & Pulp/Paper Technology
081 Environmental Science	074 Natural Resources/Conservation	098 Agricultural Sciences/Natural Resources, General
055 Fishing & Fisheries Sciences/Management	003 Natural Resources/Environmental Economics (also in SOCIAL SCIENCES)	099 Agricultural Sciences/Natural Resources, Other

LIFE SCIENCES (continued)		
BIOLOGICAL/BIOMEDICAL SCIENCES		
130 Anatomy	139 Ecology	175 Pathology, Human & Animal
110 Bacteriology	145 Endocrinology	180 Pharmacology, Human & Animal
100 Biochemistry (see also PHYSICAL SCIENCES/ Chemistry, other)	148 Entomology	185 Physiology, Human & Animal
102 Bioinformatics	167 Environmental Toxicology	115 Plant Genetics
103 Biomedical Sciences	134 Epidemiology	120 Plant Pathology/Phytopathology (also in AGRICULTURAL SCIENCES)
133 Biometrics & Biostatistics	137 Evolutionary Biology	125 Plant Physiology
105 Biophysics (also in PHYSICS)	170 Genetics/Genomics, Human & Animal	155 Structural Biology
107 Biotechnology	151 Immunology	169 Toxicology
129 Botany/Plant Biology	152 Marine Biology & Biological Oceanography	168 Virology
158 Cancer Biology	157 Microbiology	188 Wildlife Biology
136 Cell/Cellular Biology & Histology	154 Molecular Biology	189 Zoology
104 Computational Biology	160 Neurosciences & Neurobiology	198 Biology/Biomedical Sciences, General
142 Developmental Biology/Embryology	163 Nutrition Sciences	199 Biology/Biomedical Sciences, Other
166 Parasitology		
HEALTH SCIENCES		
210 Environmental Health	222 Kinesiology/Exercise Physiology	245 Rehabilitation/Therapeutic Services
227 Gerontology (also in SOCIAL SCIENCES)	240 Pharmaceutical Sciences	200 Speech-Language Pathology & Audiology
280 Health and Behavior	230 Nursing Science	250 Veterinary Sciences
217 Health Policy Analysis	207 Oral Biology/Oral Pathology	298 Health Sciences, General
212 Health Systems/Service Administration	215 Public Health	299 Health Sciences, Other
MATHEMATICS		
425 Algebra	440 Logic	450 Statistics (also in SOCIAL SCIENCES)
430 Analysis & Functional Analysis	445 Number Theory	455 Topology/Foundations
420 Applied Mathematics	465 Operations Research (also in ENGINEERING & in BUSINESS MANAGEMENT/ADMIN.)	498 Mathematics/Statistics, General
460 Computing Theory & Practice		499 Mathematics/Statistics, Other
435 Geometry/Geometric Analysis		
PHYSICAL SCIENCES		
ASTRONOMY		
500 Astronomy	505 Astrophysics	509 Astronomy, Other
ATMOSPHERIC SCIENCE & METEOROLOGY		
510 Atmospheric Chemistry & Climatology	514 Meteorology	519 Atmospheric Science/Meteorology, Other
512 Atmospheric Physics & Dynamics	518 Atmospheric Science/Meteorology, General	
CHEMISTRY		
520 Analytical Chemistry	526 Organic Chemistry	534 Theoretical Chemistry
522 Inorganic Chemistry	530 Physical Chemistry	538 Chemistry, General
528 Medicinal Chemistry	532 Polymer Chemistry	539 Chemistry, Other (see also BIOLOGICAL/Biochemistry)
GEOLOGICAL & EARTH SCIENCES		
542 Geochemistry	544 Geophysics & Seismology	550 Stratigraphy & Sedimentation
540 Geology	548 Mineralogy & Petrology	558 Geological & Earth Sciences, General
552 Geomorphology & Glacial Geology	546 Paleontology	559 Geological & Earth Sciences, Other
OCEAN/MARINE SCIENCES		
585 Hydrology & Water Resources	595 Marine Sciences	
590 Oceanography, Chemical & Physical	599 Ocean/Marine, Other	
PHYSICS		
560 Acoustics	574 Condensed Matter/Low Temperature Physics	570 Plasma/Fusion Physics
576 Applied Physics	577 Medical Physics/Radiological Science	572 Polymer Physics
561 Atomic/Molecular/Chemical Physics	568 Nuclear Physics	578 Physics, General
565 Biophysics (also in BIOLOGICAL SCIENCES)	569 Optics/Photonics	579 Physics, Other
	564 Particle (Elementary) Physics	
PSYCHOLOGY		
602 Behavioral Analysis	615 Experimental Psychology	624 Personality Psychology
600 Clinical Psychology	620 Family Psychology	633 Psychometrics & Quantitative Psychology
603 Cognitive Psychology & Psycholinguistics	614 Health & Medical Psychology	636 School Psychology (also in EDUCATION)
609 Counseling	613 Human Development & Family Studies	639 Social Psychology
612 Developmental & Child Psychology	621 Industrial & Organizational (see also BUSINESS MANAGEMENT/Organizational Behavior)	648 Psychology, General
618 Educational Psychology (also in EDUCATION)	627 Neuropsychology/Physiological Psychology	649 Psychology, Other
SOCIAL SCIENCES		
655 Anthropology, Cultural	651 Gender and Women's Studies	678 Political Science & Government
650 Anthropology, General	670 Geography	682 Public Policy Analysis
656 Anthropology, Physical and Biological	684 Gerontology (also in HEALTH SCIENCES)	686 Sociology
652 Area/Ethnic/Cultural Studies	674 International Relations/Affairs	690 Statistics (also in MATHEMATICS)
657 Criminal Justice & Corrections	676 Linguistics	694 Urban Affairs/Studies
658 Criminology	665 Natural Resource/Environmental Economics (also in AGRICULTURAL SCIENCES)	695 Urban/City, Community & Regional Planning
662 Demography/Population Studies	685 Natural Resource/Environmental Policy	698 Social Sciences, General
668 Econometrics		699 Social Sciences, Other
667 Economics		
FIELDS NOT ELSEWHERE CLASSIFIED (NEC)		
960 Architecture/Environmental Design	972 Library Science	984 Theology/Religious Education (see also OTHER HUMANITIES/Religion/Religious Studies, Ethics)
964 Family/Consumer Science/Human Science (also in EDUCATION)	974 Parks/Sports/Rec./Leisure/Fitness	989 Other Fields, NEC
968 Law	976 Public Administration	
	980 Social Work	



B5. (If postdoc or further training) What will be the main source of financial support for your "postdoc" or further training within the next year?

Mark (X) one

- 1 U.S. government
- 2 Industry/business
- 3 College or university
- 4 Private foundation
- 5 Nonprofit, other than private foundation or college
- 6 Foreign government
- 7 Other - Specify
- 8 Unknown

B6. What one type of principal employer will you be working for (or training with) in the next year?

EDUCATION

- 1 U.S. 4-year college or university other than medical school
- 2 U.S. medical school (including university-affiliated hospital or medical center)
- 3 U.S. university-affiliated research institute
- 4 U.S. community or two-year college
- 5 U.S. preschool, elementary, middle, secondary school or school system
- 6 Foreign educational institution

GOVERNMENT (other than educational institution)

- 7 Foreign government
- 8 U.S. federal government
- 9 U.S. state government
- 10 U.S. local government

PRIVATE SECTOR (other than educational institution)

- 11 Not for profit organization
- 12 Industry (for profit)

OTHER

- 13 Self-employed
- 14 Other - Specify

B7. Please name the organization and geographic location where you will work or study.

Organization

State or territory (if U.S.)

Country (if not U.S.)

Is this a college or university? Yes No

B8. What will be your basic annual salary for this principal job (in the next year)? Do not include bonuses or additional compensation for summertime teaching or research. If you are not salaried, please estimate your earned income.

\$

If you prefer not to report an exact amount, please indicate into which range you expect your salary to fall:

Mark (X) one

- | | |
|--|---|
| 1 <input type="checkbox"/> \$30,000 or less | 7 <input type="checkbox"/> \$70,001 - \$80,000 |
| 2 <input type="checkbox"/> \$30,001 - \$35,000 | 8 <input type="checkbox"/> \$80,001 - \$90,000 |
| 3 <input type="checkbox"/> \$35,001 - \$40,000 | 9 <input type="checkbox"/> \$90,001 - \$100,000 |
| 4 <input type="checkbox"/> \$40,001 - \$50,000 | 10 <input type="checkbox"/> \$100,001 - \$110,000 |
| 5 <input type="checkbox"/> \$50,001 - \$60,000 | 11 <input type="checkbox"/> \$110,001 or above |
| 6 <input type="checkbox"/> \$60,001 - \$70,000 | 12 <input type="checkbox"/> Don't know |

B9. How many months does this salary cover?

Number of Months (1-12)

B10. What will be your primary and secondary work activities?

Mark (X) one in each column

	a PRIMARY	b SECONDARY
Research and development	1 <input type="checkbox"/>	1 <input type="checkbox"/>
Teaching	2 <input type="checkbox"/>	2 <input type="checkbox"/>
Management or administration	3 <input type="checkbox"/>	3 <input type="checkbox"/>
Professional services to individuals	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Other - Specify	5 <input type="checkbox"/>	5 <input type="checkbox"/>

Mark (X) if no secondary work activities

Part C - BACKGROUND INFORMATION

C1. Are you -

- 1 Male 2 Female

C2. What is your marital status?

Mark (X) one

- 1 Married
 2 Living in a marriage-like relationship
 3 Widowed
 4 Separated
 5 Divorced
 6 Never married

C3. Not including yourself or your spouse/partner, how many dependents (children or adults) do you have - that is, how many others receive at least one half of their financial support from you?

Write in number of dependents

- 5 years of age or younger
 6 to 18 years
 19 years or older

Mark (X) if none

C4. What is the highest educational attainment of your mother and father?

Mark (X) one for each parent
 a MOTHER b FATHER

Less than high school/secondary school graduate	1	<input type="checkbox"/>	1	<input type="checkbox"/>
High school/secondary school graduate	2	<input type="checkbox"/>	2	<input type="checkbox"/>
Some college	3	<input type="checkbox"/>	3	<input type="checkbox"/>
Bachelor's degree	4	<input type="checkbox"/>	4	<input type="checkbox"/>
Master's degree (e.g., MA, MS, MBA, MSW, etc.)	5	<input type="checkbox"/>	5	<input type="checkbox"/>
Professional degree (e.g., MD, DDS, JD, D.Min, Psy.D., etc.)	6	<input type="checkbox"/>	6	<input type="checkbox"/>
Research doctoral degree	7	<input type="checkbox"/>	7	<input type="checkbox"/>
Not applicable/Unknown	8	<input type="checkbox"/>	8	<input type="checkbox"/>

C5. What is your place of birth?

State or territory (if U.S.) ...
OR
 Country (if not U.S.)

C6. What is your date of birth?

Month Day Year 1 9

C7. What is your citizenship status?

Mark (X) one

U.S. CITIZEN

- 1 Since birth → SKIP TO C9
 2 Naturalized →

NON-U.S. CITIZEN

- 3 With a Permanent U.S. Resident Visa ("Green Card") → GO TO C8
 4 With a Temporary U.S. Visa →

C8. (If a non-U.S. citizen) Of which country are you a citizen?

Specify country of present citizenship

C9. In what state or country was the high school/secondary school that you last attended?

State or territory (if U.S.) ...
OR
 Country (if not U.S.)

C10. Are you Hispanic or Latino?

Mark (X) one

- 1 No, I am not Hispanic or Latino
 2 Yes, I am Mexican or Chicano
 3 Yes, I am Puerto Rican
 4 Yes, I am Cuban
 5 Yes, I am Other Hispanic or Latino - Specify

C11. What is your racial background?

Mark (X) one or more

- a American Indian or Alaska Native
Specify tribal affiliation(s)

 b Native Hawaiian or other Pacific Islander
 c Asian
 d Black or African American
 e White

C12. The following several questions are designed to help us better understand the educational paths of individuals with specific functional limitations. What is the USUAL degree of difficulty you have with...

Mark (X) one in each row

	NONE	SLIGHT	MODERATE	SEVERE	UNABLE TO DO
1 SEEING words or letters in ordinary newsprint (with glasses/contact lenses, if you usually wear them)	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
2 HEARING what is normally said in conversation with another person (with hearing aid, if you usually wear one)	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
3 WALKING without human or mechanical assistance or using stairs	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
4 LIFTING or carrying something as heavy as 10 pounds, such as a bag of groceries	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
5 CONCENTRATING, REMEMBERING, or MAKING DECISIONS because of a physical, mental or emotional condition	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

C13. Mark this box (X) if you answered "NONE" to all the activities in Question C12, and go to Question C15.

C14. What is the earliest age at which you first began experiencing any difficulties in any of these areas?

Age OR Since birth

C15. Please fill in the last four digits of your Social Security Number.

- -

C16. In case we need to clarify some of the information you have provided, please list your current address, an email address and telephone number where you can be reached.

Your Current Street Address

City/State/Country/Zip or Postal Code

Email Address

Daytime or Cell Telephone Number (including area or country code)

C17. Please provide the name and address of a person who is likely to know where you can be reached in case your address changes in the near future.

Name of person who will know where you can be reached

Street Address

City/State/Country/Zip or Postal Code

Email Address

Telephone Number (including area or country code)

REMINDER: ALL INFORMATION YOU PROVIDE WILL BE TREATED AS CONFIDENTIAL and used only for research or statistical purposes by your doctoral institution, the survey sponsors, their contractors, and collaborating researchers for the purpose of analyzing data, preparing scientific reports and articles, and selecting samples for a limited number of carefully defined follow-up studies.

Thank you for completing this questionnaire. Please use the back cover to make any additional comments you may have about this survey. The results of this survey will be published in an annual report; the annual reports on earlier surveys are available at: www.sedsurvey.org

Please return this questionnaire to your GRADUATE SCHOOL for forwarding to:

**Survey of Earned Doctorates
NORC at the University of Chicago
1 N. State Street, Floor 16
Chicago, IL 60602**

If you have questions or concerns about this survey, you may contact us by email at: sed@norc.org

Or phone at: 1-800-248-8649

For more information about the SED, go to: www.sedsurvey.org

If you have questions about your rights as a study participant, you may call the NORC IRB Administrator toll-free at: 1-866-309-0542

To the Doctorate Recipient:

Congratulations on earning a doctoral degree!

Your accomplishment is significant for both this nation and others, as the new knowledge generated by research doctorates enhances the quality of life in this country and throughout the world. Because of the importance of persons earning research doctorates, several Federal agencies—listed on the cover—sponsor this Survey of Earned Doctorates.

The basic purpose of this survey is to gather objective data about doctoral graduates. These data play an important role in local, regional and national initiatives concerning graduate education. Through outreach meetings with our constituents we have learned that decision makers in universities, private organizations and government agencies use data from the Survey of Earned Doctorates when developing new programs and allocating resources to current programs. If you have any comments about the survey, please provide them in the space below.

On behalf of the sponsoring Federal agencies, I thank you for your participation in this survey.

Best wishes,

John R. Gawalt
National Science Foundation

ADDITIONS TO QUESTIONS

A9. (continued from page 3)

Third Additional Degree

Degree type _____
 Degree field _____
 Field number, pp. 6-7 _____
 Month/year granted _____
 Institution _____
 Branch or city _____
 State or country _____

Fourth Additional Degree

Degree type _____
 Degree field _____
 Field number, pp. 6-7 _____
 Month/year granted _____
 Institution _____
 Branch or city _____
 State or country _____



Comments about the survey:

OFFICE USE ONLY					
Case ID:	Instit. Code:	Grad Date:	Main Disp.:		
PROCESSING					
Receipt		Editing		CADE	
Initials	Date	Initials	Date	Initials	Date
Ver. Adjust		Retrieval		Updates	
Initials	Date	Initials	Date	Initials	Date

**Appendix B
2015 Survey of Doctorate Recipients**



**2015
Survey of Doctorate Recipients**

Conducted by
NORC at the University of Chicago
for



The National Science Foundation and The National Institutes of Health

This information is solicited under the authority of the National Science Foundation Act of 1950, as amended, and the Confidential Information Protection and Statistical Efficiency Act of 2002. The information you provide will be used for statistical purposes only. Your responses will be kept confidential. Your response is voluntary and you are not required to provide some or all of the requested information will not in any way adversely affect you. The average time to complete this survey is about 25 minutes. Please send any comments on the time required for this survey to National Science Foundation, 4201 Wilson Blvd., Suite 215, Arlington, VA 22230, Attn: NSF Reports Clearance Officer.

Please make any name/address changes below:

First Name _____ M.I. _____

Last Name _____

Number and Street _____

City/Town _____

State or Country _____ ZIP or Postal Code _____

Office Use Only

RC Edit CADE VER Adj

OMB No.: 3145-0020
Approval Expires: 8/31/2018 Int

INFORMATION COPY
DO NOT USE TO REPORT

INSTRUCTIONS

Thank you for taking the time to complete this questionnaire. Directions for filling it out are provided with each question.

- In order to get comparable data, we will be asking you to refer to the week of February 1, 2015, when answering most questions.
- Follow all appropriate skip instructions after marking a box. If no skip instruction is provided, you should continue to the next question.

Thank you again for your help; we really appreciate it.

Part A - Employment Situation

A1. Were you working for pay or profit during the week of February 1, 2015?

Working includes being self-employed and not getting paid that week, on a postdoctoral appointment, traveling while employed, or on any type of paid or unpaid leave, including vacation.

Use an X to mark your answer.

- 1 Yes → Go to question A8
- 2 No

A2. (If No) Did you look for work during the four weeks preceding February 1, 2015? This would be between January 4th and February 1st.

- 1 Yes
- 2 No

A3. What were your reasons for not working during the week of February 1, 2015?

Mark Yes or No for each item.

- | | Yes | No | | | | | |
|--|----------------------------|----------------------------|--|--|--|--|--|
| | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 1 Retired..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| If Yes → <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> | | | | | | | |
| | | | | | | | |
| 2 On layoff from a job..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 3 Student..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 4 Family responsibilities..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 5 Chronic illness or permanent disability..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 6 Suitable job not available..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 7 Did not need or want to work..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |
| 8 Other – Specify ↴..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | | | | | |

A4. Prior to the week of February 1, 2015, when did you last work for pay or profit?

← Mark this box if you never worked for pay or profit and then go to page 10, question D1

LAST WORKED

--	--	--	--	--

--	--	--	--	--

A5. What was the title of the last job you held prior to the week of February 1, 2015?

Example: Physics professor

A6. What kind of work were you doing on this last job – that is, what were your duties and responsibilities on your last job? Please be as specific as possible, including any area of specialization.

Example: Taught physics and conducted research. Specialized in high energy physics.

A7. Using the JOB CATEGORY list on pages 16-17, choose the code that best describes the last job you held prior to the week of February 1, 2015.

CODE

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 → Go to page 8, question A42

A8. Although you were working during the week of February 1, had you previously retired from any position?

Examples of retirement include mandatory retirement, early retirement, or voluntary retirement.

1 Yes →

--	--	--	--	--

2 No

Principal Employer	
<p>A9. Who was your principal employer during the week of February 1, 2015?</p> <p><i>If you had <u>more than one job</u>, report the one for which you worked the most hours that week.</i></p> <p><i>If your <u>employer had more than one location</u>, report the location that employed you.</i></p> <p><i>If you worked for a <u>contracting or consulting company</u>, report the name of that company, not the client organization.</i></p> <p>Employer Name _____</p> <p>Department/Division _____</p> <p>City/Town _____</p> <p>State/Territory or Country _____</p> <p>ZIP Code or Postal Code _____</p>	<p>A11. Counting all locations where this employer operates, how many people work for your principal employer? Your best estimate is fine.</p> <p><i>Mark one answer.</i></p> <p><input type="checkbox"/> 1 10 or fewer employees</p> <p><input type="checkbox"/> 2 11 - 24 employees</p> <p><input type="checkbox"/> 3 25 - 99 employees</p> <p><input type="checkbox"/> 4 100 - 499 employees</p> <p><input type="checkbox"/> 5 500 - 999 employees</p> <p><input type="checkbox"/> 6 1,000 - 4,999 employees</p> <p><input type="checkbox"/> 7 5,000 - 24,999 employees</p> <p><input type="checkbox"/> 8 25,000 or more employees</p>
<p>A10. What was that employer's <u>main business or industry</u> – that is, what did that employer make or do?</p> <p><i>If your principal employer had <u>more than one type of business</u>, report the type of business primarily performed at the location where you worked.</i></p> <p><i>Example: Production of microprocessor chips</i></p> <p>EMPLOYER'S MAIN BUSINESS</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>A12. Did your principal employer come into being as a new business within the past 5 years?</p> <p><input type="checkbox"/> 1 Yes</p> <p><input type="checkbox"/> 2 No</p> <p>A13. Which one of the following best describes your principal employer during the week of February 1, 2015? Were you...</p> <p><i>Mark one answer.</i></p> <p>SELF-EMPLOYED or a BUSINESS OWNER</p> <p><input type="checkbox"/> 1 In a <u>non-incorporated</u> business, professional practice, or farm</p> <p><input type="checkbox"/> 2 In an <u>incorporated</u> business, professional practice, or farm</p> <p>PRIVATE SECTOR employee</p> <p><input type="checkbox"/> 3 In a <u>for-profit</u> company or organization</p> <p><input type="checkbox"/> 4 In a <u>non-profit</u> organization (including tax-exempt and charitable organizations)</p> <p>U.S. GOVERNMENT employee</p> <p><input type="checkbox"/> 5 In a <u>local</u> government in the U.S. (e.g., city, county, school district)</p> <p><input type="checkbox"/> 6 In a <u>U.S. state</u> government (including U.S. state colleges/universities)</p> <p><input type="checkbox"/> 7 In the <u>U.S. military</u> service, active duty or Commissioned Corps (e.g., USPHS, NOAA)</p> <p><input type="checkbox"/> 8 In the <u>U.S. Federal Government</u> (e.g., civilian employee)</p> <p>OTHER type of employee</p> <p><input type="checkbox"/> 9 Other – <i>Specify type of employer</i> ↴</p> <p>_____</p> <p><input type="checkbox"/> 10 In a <u>non-U.S. government</u> at any level</p>

A14. Was your principal employer an educational institution?

- 1 Yes
- 2 No → *Go to page 4, question A19*

A15. (If Yes) Was the educational institution where you worked a...

Mark one answer.

- 1 Preschool, elementary, middle, or secondary school or system } *Go to page 4, question A19*
- 2 Two-year college, community college, or technical institute
- 3 Four-year college or university, other than a medical school
- 4 Medical school (including university-affiliated hospital or medical center)
- 5 University-affiliated research institute
- 6 Other – *Specify*

A16. During the week of February 1, 2015, what type of academic position(s) did you hold at this institution?

Mark Yes or No for each item.

- | | Yes | No |
|--|----------------------------|----------------------------|
| 1 President, Provost, or Chancellor (any level)..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 2 Dean (any level), department head, or department chair..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 3 Research faculty, scientist, associate, or fellow..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 4 Teaching faculty..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 5 Adjunct faculty..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 6 Postdoc (e.g., postdoctoral fellow or associate)..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 7 Research assistant..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 8 Teaching assistant..... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 9 Other position – <i>Specify</i> <input style="width: 150px; height: 20px;" type="text"/> | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |

A17. What was your faculty rank?

Mark one answer.

- 1 Not applicable: no ranks designated at this institution
- 2 Not applicable: no ranks designated for my position
- 3 Professor
- 4 Associate Professor
- 5 Assistant Professor
- 6 Instructor
- 7 Lecturer
- 8 Other – *Specify*

A18. What was your tenure status?

Mark one answer.

- 1 Not applicable: no tenure system at this institution
- 2 Not applicable: no tenure system for my position
- 3 Tenured →

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- 4 On tenure track but not tenured
- 5 Not on tenure track

Principal Job																									
<p>A19. What was the title of the principal job you held during the week of February 1, 2015?</p> <p><i>Example: Physics professor</i></p> <div style="border: 1px solid black; height: 25px; width: 100%;"></div>	<p>A23. Was this job a "postdoc"?</p> <p><i>A "postdoc" is a temporary position awarded in academe, industry, a non-profit organization, or government primarily for gaining additional education and training in research.</i></p> <p>1 <input type="checkbox"/> Yes 2 <input type="checkbox"/> No → Go to question A26</p>																								
<p>A20. What kind of work were you doing on this job – that is, what were your duties and responsibilities on your principal job? Please be as specific as possible, including any area of specialization.</p> <p><i>Example: Taught physics and conducted research. Specialized in high energy physics.</i></p> <div style="border: 1px solid black; height: 60px; width: 100%;"></div>	<p>A24. (If Yes) What were your reasons for taking this postdoc?</p> <p><i>Mark Yes or No for each item.</i></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 5%; text-align: center;">Yes</th> <th style="width: 5%; text-align: center;">No</th> </tr> <tr> <th></th> <th style="text-align: center;">↓</th> <th style="text-align: center;">↓</th> </tr> </thead> <tbody> <tr> <td>1 Additional training in PhD field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>2 Training in an area outside of PhD field.....</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>3 Work with a specific person or in a specific place.....</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>4 Other employment not available</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>5 Postdoc generally expected for a career in this field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>6 Some other reason – <i>Specify</i> 7.....</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> </tbody> </table> <div style="border: 1px solid black; height: 25px; width: 100%; margin-top: 5px;"></div>		Yes	No		↓	↓	1 Additional training in PhD field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 Training in an area outside of PhD field.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 Work with a specific person or in a specific place.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	4 Other employment not available	1 <input type="checkbox"/>	2 <input type="checkbox"/>	5 Postdoc generally expected for a career in this field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	6 Some other reason – <i>Specify</i> 7.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>
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<p>A21. Using the JOB CATEGORY list on pages 16-17, choose the code that <u>best</u> describes the principal job you held during the week of February 1, 2015.</p> <p>CODE <table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td><td style="border: 1px solid black; width: 20px; height: 20px;"></td><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr></table></p>				<p>A25. Which <u>two</u> reasons in question A24 were your <u>most</u> important reasons for taking this postdoc?</p> <p><i>Enter number of appropriate reason from question A24 above.</i></p> <p>1 <table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td></tr></table> <u>Most</u> important reason</p> <p>2 <table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 30px; height: 20px;"></td></tr></table> <u>Second most</u> important reason <i>(Enter "0" if no second reason)</i></p>																					
<p>A22. Did your duties on this job require the technical expertise of a bachelor's degree or higher in...</p> <p><i>Mark Yes or No for each item.</i></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 5%; text-align: center;">Yes</th> <th style="width: 5%; text-align: center;">No</th> </tr> <tr> <th></th> <th style="text-align: center;">↓</th> <th style="text-align: center;">↓</th> </tr> </thead> <tbody> <tr> <td>1 Engineering, computer science, math, or the natural sciences</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>2 The social sciences</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>3 Some other field (e.g., health, business, or education) – <i>Specify</i> 7.....</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> </tbody> </table> <div style="border: 1px solid black; height: 25px; width: 100%; margin-top: 5px;"></div>		Yes	No		↓	↓	1 Engineering, computer science, math, or the natural sciences	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 The social sciences	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 Some other field (e.g., health, business, or education) – <i>Specify</i> 7.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	<p>A26. During what month and year did you start this job (that is, the principal job you held during the week of February 1, 2015)?</p> <table style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;">Month</th> <th style="width: 10%; text-align: center;">Year</th> </tr> </thead> <tbody> <tr> <td>PRINCIPAL JOB STARTED</td> <td style="text-align: center;"><table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr></table></td> <td style="text-align: center;"><table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr></table></td> </tr> </tbody> </table>		Month	Year	PRINCIPAL JOB STARTED	<table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr></table>		<table style="display: inline-table; border-collapse: collapse;"><tr><td style="border: 1px solid black; width: 20px; height: 20px;"></td><td style="border: 1px solid black; width: 20px; height: 20px;"></td></tr></table>		
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A27. To what extent was your work on your principal job related to your first U.S. doctoral degree? Was it...

Mark one answer.

- 1 Closely related
 2 Somewhat related
 3 Not related
- } → **Go to question A30**

A28. (If Not related) Did these factors influence your decision to work in an area outside the field of your first U.S. doctoral degree?

Mark Yes or No for each item.

- | | | Yes
↓ | No
↓ |
|---|---|--------------------------|----------------------------|
| 1 Pay, promotion opportunities | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 2 Working conditions (e.g., hours, equipment, working environment)..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 3 Job location | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 4 Change in career or professional interests..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 5 Family-related reasons (e.g., children, spouse's job moved) | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 6 Job in doctoral degree field not available | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 7 Some other reason – Specify 7 | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |

A29. Which two factors in question A28 were your most important reasons for working in an area outside the field of your first U.S. doctoral degree?

Enter number of appropriate reason from question A28 above.

- 1 Most important reason
- 2 Second most important reason
 (Enter "0" if no second reason)

A30. The next question is about your work activities on your principal job. Which of the following work activities occupied at least 10 percent of your time during a typical work week on this job?

Mark Yes or No for each item.

- | | | Yes
↓ | No
↓ |
|--|---|--------------------------|----------------------------|
| 1 Accounting, finance, contracts | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 2 Basic research – study directed toward gaining scientific knowledge primarily for its own sake..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 3 Applied research – study directed toward gaining scientific knowledge to meet a recognized need..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 4 Development – using knowledge gained from research for the production of materials, devices | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 5 Design of equipment, processes, structures, models..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 6 Computer programming, systems or applications development | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 7 Human resources – including recruiting, personnel development, training..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 8 Managing or supervising people or projects..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 9 Production, operations, maintenance (e.g., chip production, operating lab equipment) | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 10 Professional services (e.g., health care, counseling, financial services, legal services) | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 11 Sales, purchasing, marketing, customer service, public relations | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 12 Quality or productivity management | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 13 Teaching..... | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 14 Other – Specify 7 | 1 | <input type="checkbox"/> | 2 <input type="checkbox"/> |

A31. On which two activities in question A30 did you work the most hours during a typical week on this job?

Enter number of appropriate activity from question A30 above.

- 1 Activity most hours
- 2 Activity second most hours
 (Enter "0" if no second most)

A32. Did you supervise the work of others as part of the principal job you held during the week of February 1, 2015?

Mark "Yes" if you recommended or initiated personnel actions such as hiring, firing, evaluating, or promoting others.

Teachers: Do not count students.

- 1 Yes
- 2 No → Go to question A34

A33. (If Yes) How many people did you typically...

- | | Number supervised |
|---|----------------------|
| 1 Supervise <u>directly</u> ? | <input type="text"/> |
| | (If none, enter "0") |
| 2 Supervise <u>indirectly</u> through subordinate supervisors?..... | <input type="text"/> |
| | (If none, enter "0") |

A34. Thinking about your principal job held during the week of February 1, please rate your satisfaction with that job's...

Mark one answer for each item.

	Very satisfied	Somewhat satisfied	Somewhat dissatisfied	Very dissatisfied
	↓	↓	↓	↓
1 Salary	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
2 Benefits.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
3 Job security	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
4 Job location	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
5 Opportunities for advancement.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
6 Intellectual challenge	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
7 Level of responsibility	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
8 Degree of independence	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
9 Contribution to society.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

A35. How would you rate your overall satisfaction with the principal job you held during the week of February 1, 2015?

Mark one answer.

- 1 Very satisfied
- 2 Somewhat satisfied
- 3 Somewhat dissatisfied
- 4 Very dissatisfied

A36. As of the week of February 1, 2015, what was your basic annual salary on your principal job, before deductions?

Do not include bonuses, overtime, or additional compensation for summertime teaching or research. If you are not salaried, please estimate your earned income, excluding business expenses.

\$, , , , , .00 in USD
ANNUAL SALARY OR EARNED INCOME

A37. Was this salary based on a 52-week year, or less than that?

Include paid vacation and sick leave.

1 52-week year
 2 Less than 52 weeks →
NUMBER OF WEEKS PER YEAR

A38. During a typical week on your principal job, how many hours did you work?

NUMBER OF HOURS WORKED PER WEEK

If fewer than 35 hours, go to question A39.

If 35 or more hours, go to question A41.

A39. *(If fewer than 35 hours)* Did you want to work 35 or more hours per week on your principal job?

1 Yes
 2 No

A40. For which of the following reasons did you usually work fewer than 35 hours per week on the principal job you held during the week of February 1, 2015?

Mark Yes or No for each item.

	Yes ↓	No ↓
1 Previously retired or semi-retired	1 <input type="checkbox"/>	2 <input type="checkbox"/>
<i>If Yes</i> →	Year retired <input type="text"/>	
2 Student	1 <input type="checkbox"/>	2 <input type="checkbox"/>
3 Family responsibilities	1 <input type="checkbox"/>	2 <input type="checkbox"/>
4 Full-time job not available.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>
5 Held more than one job	1 <input type="checkbox"/>	2 <input type="checkbox"/>
6 Did not need or want to work more hours.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>
7 Other – Specify <u>7</u>	1 <input type="checkbox"/>	2 <input type="checkbox"/>
	<input type="text"/>	

A41. Concerning your principal job during the week of February 1, 2015, were any of the following benefits available to you, even if you chose not to take them?

Mark Yes or No for each item.

	Yes ↓	No ↓
1 Health insurance that was at least partially paid by your employer.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>
2 A pension plan or a retirement plan to which your employer contributed.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>
3 A profit-sharing plan	1 <input type="checkbox"/>	2 <input type="checkbox"/>
4 Paid vacation, sick, or personal days ..	1 <input type="checkbox"/>	2 <input type="checkbox"/>

Part C - Other Work-Related Experiences																																																																														
<p>C1. During the past 12 months, did you take any work-related training, such as workshops or seminars?</p> <p><i>Include conferences or professional meetings <u>only</u> if you attended a training session at the conference or meeting.</i></p> <p><i>Do <u>not</u> include college coursework for which you were enrolled in a degree program.</i></p> <p>1 <input type="checkbox"/> Yes</p> <p>2 <input type="checkbox"/> No → <i>Go to question C4</i></p> <p>C2. (If Yes) For which of the following reasons did you take training during the past 12 months?</p> <p><i>Mark Yes or No for each item.</i></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 5%; text-align: center;">Yes ↓</th> <th style="width: 5%; text-align: center;">No ↓</th> </tr> </thead> <tbody> <tr> <td>1 To improve skills or knowledge in your current occupational field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>2 To increase opportunities for promotion or advancement in your current occupational field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>3 For licensure or certification in your current occupational field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>4 To facilitate a change to a different occupational field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>5 Required or expected by employer</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>6 For leisure or personal interest</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>7 Other – <i>Specify</i> ↴</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td colspan="3" style="height: 20px;"></td> </tr> </tbody> </table> <p>C3. What was your most important reason from question C2 for taking training?</p> <p><i>Enter number of appropriate reason from question C2 above.</i></p> <p>MOST IMPORTANT REASON <input style="width: 30px;" type="text"/></p>		Yes ↓	No ↓	1 To improve skills or knowledge in your current occupational field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 To increase opportunities for promotion or advancement in your current occupational field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 For licensure or certification in your current occupational field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	4 To facilitate a change to a different occupational field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	5 Required or expected by employer	1 <input type="checkbox"/>	2 <input type="checkbox"/>	6 For leisure or personal interest	1 <input type="checkbox"/>	2 <input type="checkbox"/>	7 Other – <i>Specify</i> ↴	1 <input type="checkbox"/>	2 <input type="checkbox"/>				<p>C4. During the past 12 months, did you attend any professional society or association meetings or professional conferences?</p> <p><i>Include regional, national, or international meetings.</i></p> <p>1 <input type="checkbox"/> Yes</p> <p>2 <input type="checkbox"/> No</p> <p>C5. To how many regional, national, or international professional societies or associations do you currently belong?</p> <p><i>If none, enter "0."</i></p> <p>NUMBER <input style="width: 30px;" type="text"/></p> <p>C6. When thinking about a job, how important is each of the following factors to you?</p> <p><i>Mark one answer for each item.</i></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 8%; text-align: center;">Very important ↓</th> <th style="width: 8%; text-align: center;">Somewhat important ↓</th> <th style="width: 8%; text-align: center;">Somewhat unimportant ↓</th> <th style="width: 8%; text-align: center;">Not important at all ↓</th> </tr> </thead> <tbody> <tr> <td>1 Salary</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>2 Benefits</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>3 Job security</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>4 Job location</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>5 Opportunities for advancement</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>6 Intellectual challenge</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>7 Level of responsibility</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>8 Degree of independence</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> <tr> <td>9 Contribution to society</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> <td style="text-align: center;">3 <input type="checkbox"/></td> <td style="text-align: center;">4 <input type="checkbox"/></td> </tr> </tbody> </table>		Very important ↓	Somewhat important ↓	Somewhat unimportant ↓	Not important at all ↓	1 Salary	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	2 Benefits	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	3 Job security	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 Job location	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 Opportunities for advancement	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	6 Intellectual challenge	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	7 Level of responsibility	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	8 Degree of independence	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	9 Contribution to society	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
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Part D - Recent Educational Experiences																																		
<p>D1. Between February 2013 and February 2015, did you complete another degree such as a master's or another doctorate?</p> <p>1 <input type="checkbox"/> Yes</p> <p>2 <input type="checkbox"/> No → Go to page 11, question D7</p> <p>D2. (If Yes) What type of degree did you earn?</p> <p><i>If you completed more than one degree, mark the level for the highest degree awarded.</i></p> <p><i>Mark one answer.</i></p> <p>1 <input type="checkbox"/> Bachelor's degree (e.g., BS, BA, AB)</p> <p>2 <input type="checkbox"/> Master's degree (e.g., MS, MA, MBA)</p> <p>3 <input type="checkbox"/> Doctorate (e.g., PhD, DSc, EdD)</p> <p>4 <input type="checkbox"/> Other professional degree (e.g., JD, LLB, MD, DDS, DVM) – Specify ↴</p> <div style="border: 1px solid black; height: 20px; width: 100%; margin-bottom: 5px;"></div> <p>5 <input type="checkbox"/> Other – Specify ↴</p> <div style="border: 1px solid black; height: 20px; width: 100%; margin-bottom: 5px;"></div> <p>D3. What was the primary field of study for this degree?</p> <p>PRIMARY FIELD OF STUDY</p> <div style="border: 1px solid black; height: 20px; width: 100%; margin-bottom: 5px;"></div> <div style="border: 1px solid black; height: 20px; width: 100%; margin-bottom: 5px;"></div> <div style="border: 1px solid black; height: 20px; width: 100%; margin-bottom: 5px;"></div> <p>D4. In what month and year was this degree awarded?</p> <p style="text-align: center;">Month Year</p> <p>DEGREE AWARDED <input type="text" value=""/> <input type="text" value=""/> <input type="text" value="2"/> <input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value=""/></p>	<p>D5. From which academic institution did you receive this degree?</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">College or University Name</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Department</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">City/Town</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">State/Territory or Country</div> <p>D6. For which of the following reasons did you obtain this degree?</p> <p><i>Mark Yes or No for each item.</i></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> <tr> <th></th> <th style="text-align: center;">↓</th> <th style="text-align: center;">↓</th> </tr> </thead> <tbody> <tr> <td>1 To gain further education before beginning a career</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>2 To prepare for graduate school or further education</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>3 To change your academic or occupational field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>4 To gain <u>further</u> skills or knowledge in your academic or occupational field</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>5 For licensure or certification</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>6 To increase opportunities for promotion, advancement, or higher salary</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>7 Required or expected by employer</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>8 For leisure or personal interest</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> <tr> <td>9 Other – Specify ↴</td> <td style="text-align: center;">1 <input type="checkbox"/></td> <td style="text-align: center;">2 <input type="checkbox"/></td> </tr> </tbody> </table> <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>		Yes	No		↓	↓	1 To gain further education before beginning a career	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 To prepare for graduate school or further education	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 To change your academic or occupational field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	4 To gain <u>further</u> skills or knowledge in your academic or occupational field	1 <input type="checkbox"/>	2 <input type="checkbox"/>	5 For licensure or certification	1 <input type="checkbox"/>	2 <input type="checkbox"/>	6 To increase opportunities for promotion, advancement, or higher salary	1 <input type="checkbox"/>	2 <input type="checkbox"/>	7 Required or expected by employer	1 <input type="checkbox"/>	2 <input type="checkbox"/>	8 For leisure or personal interest	1 <input type="checkbox"/>	2 <input type="checkbox"/>	9 Other – Specify ↴	1 <input type="checkbox"/>	2 <input type="checkbox"/>
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D7. During the week of February 1, 2015, were you enrolled in or taking courses at a college or university?

- 1 Yes
- 2 No → *Go to page 12, question E1*

D8. (If Yes) Were you taking courses or enrolled as...

Mark one answer.

- 1 A full-time student in a degree program
- 2 A part-time student in a degree program
- 3 Not enrolled in a degree program, but taking courses

D9. Toward what degree were you working?

If you were working toward more than one degree, mark the level for the highest degree.

Mark one answer.

- 0 No specific degree → *Go to question D11*

- 1 Bachelor's degree (e.g., BS, BA, AB)
- 2 Master's degree (e.g., MS, MA, MBA)
- 3 Doctorate (e.g., PhD, DSc, EdD)
- 4 Other professional degree (e.g., JD, LLB, MD, DDS, DVM) – *Specify type* ↴

- 5 Other – *Specify type* ↴

D10. What was the primary field of study for this degree?

PRIMARY FIELD OF STUDY

D11. For which of the following reasons were you taking courses or enrolled?

Mark Yes or No for each item.

- | | Yes | No |
|---|----------------------------|----------------------------|
| 1 To gain further education before beginning a career | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 2 To prepare for graduate school or further education | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 3 To change your academic or occupational field | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
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| 7 Required or expected by employer | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 8 For leisure or personal interest | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 9 Other – <i>Specify</i> ↴ | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |

D12. Were any of your school-related costs for taking courses paid for by an employer?

- 1 Yes
- 2 No

Part E - Demographic Information

E1. On February 1, 2015, were you...

Mark one answer.

- 1 Married
 - 2 Living in a marriage-like relationship
 - 3 Widowed
 - 4 Separated
 - 5 Divorced
 - 6 Never married
- } → **Go to question E4**

E2. (If Married or Living in a marriage-like relationship) During the week of February 1, 2015, was your spouse or partner working?

- 1 Yes, full-time
- 2 Yes, part-time
- 3 No → **Go to question E4**

E3. (If Yes) Did your spouse's or partner's duties on this job require the technical expertise of a bachelor's degree or higher in...

Mark Yes or No for each item.

- | | Yes | No |
|---|----------------------------|----------------------------|
| 1 Engineering, computer science, math, or the natural sciences | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 2 The social sciences | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |
| 3 Some other field (e.g., health, business, or education) – Specify 7 ... | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> |

E4. As of the week of February 1, 2015, did you have any children living with you as part of your family?

Only count children who lived with you at least 50 percent of the time.

- 1 Yes
- 2 No → **Go to page 13, question E6**

E5. (If Yes) How many of these children living with you as part of your family were...

If no children in a category, enter "0."

	Number of children
1 Under age 2	<input style="width: 50px;" type="text"/>
2 Aged 2-5.....	<input style="width: 50px;" type="text"/>
3 Aged 6-11.....	<input style="width: 50px;" type="text"/>
4 Aged 12-18.....	<input style="width: 50px;" type="text"/>
5 Aged 19 or older.....	<input style="width: 50px;" type="text"/>

E6. On February 1, 2015, were you living in the United States or Puerto Rico, another U.S. territory, or were you living in another country?

Mark one answer.

- 1 United States or Puerto Rico
 2 Another U.S. territory
 3 Another country – Specify

E7. On February 1, 2015, were you a...

- 1 U.S. citizen
 2 Non-U.S. citizen → Go to question E9

E8. (If U.S. citizen) Were you a U.S. citizen...

Mark one answer.

- 1 Born in the United States, Puerto Rico, or another U.S. territory
 2 Born abroad of U.S. citizen parent(s)
 3 By naturalization
- Go to question E11

E9. (If Non-U.S. citizen) Were you a non-U.S. citizen...

- 1 With a Permanent U.S. Resident Visa (Green Card)
 2 With a Temporary U.S. Resident Visa
 3 Who no longer held a U.S. Resident Visa

E10. Of which country are you a citizen?

COUNTRY

E11. What is your birthdate?

Month Day Year

E12. These questions are asked to verify that our records are correct and that we have reached the correct person selected for this study.

1 At which U.S. institution did you receive your first research doctorate?

U.S. GRADUATE INSTITUTION

2 In what field of study did you receive your first research doctorate?

DOCTORAL FIELD OF STUDY

3 In what month and year did you receive your first research doctorate?

Month Year

E13. The next several questions are designed to help us better understand the career paths of individuals with specific functional limitations.

What is the USUAL degree of difficulty you have with...

Mark one answer for each item.

	None	Slight	Moderate	Severe	Unable to do
1 SEEING words or letters in ordinary newsprint (with glasses/contact lenses, if you usually wear them)	↓ 1 <input type="checkbox"/>	↓ 2 <input type="checkbox"/>	↓ 3 <input type="checkbox"/>	↓ 4 <input type="checkbox"/>	↓ 5 <input type="checkbox"/>
2 HEARING what is normally said in conversation with another person (with hearing aid, if you usually wear one).....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
3 WALKING without human or mechanical assistance or using stairs.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
4 LIFTING or carrying something as heavy as 10 pounds, such as a bag of groceries.....	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>
5 CONCENTRATING, REMEMBERING, or MAKING DECISIONS because of a physical, mental, or emotional condition	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>

E14. Mark this box if you answered "None" to all the activities in question E13, and go to question E16.

E15. What is the earliest age at which you first began experiencing any difficulties in any of these areas?

AGE OR SINCE BIRTH

E16. In case we need to clarify some of the information you have provided, please list phone numbers and an email address where you can be reached.

Home Phone Number - -
Country Code Area/City Code Number

Work Phone Number - -
Country Code Area/City Code Number

Cell Phone Number - -
Country Code Area/City Code Number

Email Address @

E17. Because we are interested in how education and employment change over time, we may be contacting you in 2017. To help us contact you, please provide the name and contact information for two people who are likely to know where you can be reached. Do not include someone who lives in your household.

As with all the information provided in this questionnaire, complete confidentiality will be provided. These people will only be contacted if we have difficulty contacting you in 2017.

Person 1 Decline to answer

First Name	MI	Last Name
Email Address		
@		
Number and Street Address		
City/Town	State	ZIP/Postal Code
Country (if outside of U.S.)		
	-	
Country Code (if non-US)	Area/City Code	Number

Person 2 Decline to answer

First Name	MI	Last Name
Email Address		
@		
Number and Street Address		
City/Town	State	ZIP/Postal Code
Country (if outside of U.S.)		
	-	
Country Code (if non-US)	Area/City Code	Number

E18. How would you like to complete future rounds of this survey?

Mark one answer.

- 1 A questionnaire sent in the mail
- 2 A web questionnaire on the Internet
- 3 A telephone interview
- 4 No preference

JOB CATEGORY				
If you cannot find the code that best describes your job, use the "OTHER" code under the most appropriate broad category. If none of the codes fit your job, use Code 500.				
• Biological/Life Scientists	021	Agricultural and food scientists	025	Medical scientists (excluding practitioners)
	022	Biochemists and biophysicists	026	Technologists and technicians in the biological/life sciences
	023	Biological scientists (e.g., botanists, ecologists, zoologists)	027	OTHER biological and life scientists
	024	Forestry and conservation scientists		
• Clerical/Administrative Support Occupations	031	Accounting clerks and bookkeepers	033	OTHER administrative (e.g., record clerks, telephone operators)
	032	Secretaries, receptionists, typists		
• Clergy/Other Religious Workers	040	Clergy and other religious workers		
• Computer Occupations <i>Also consider 173 Operations research analysts, including modeling</i>	***	Computer engineers – <i>also consider 087 Computer engineers – hardware and 088 Computer engineers – software</i>	056	Database administrators
	051	Computer & information scientists, research	057	Information security analysts
	052	Computer network architect	058	Network and computer systems administrators
	053	Computer programmers (business, scientific, process control)	059	Software developers – applications and systems software
	054	Computer support specialists	060	Web developers
	055	Computer system analysts	061	OTHER computer and information science occupations
• Consultants	<i>Find the category on page 16 or 17 that comes closest to your field of consulting and select the code</i>			
• Counselors	070	Counselors (Educational, vocational, mental health and substance abuse) <i>Also consider 236 Psychologists, including clinical</i>		
• Engineers/Architects <i>Also consider 100 to 104 under Engineering Technologists, Technicians and Surveyors</i>	081	Architects	090	Environmental engineers
	082	Aeronautical/aerospace/astronautical engineers	091	Industrial engineers
	083	Agricultural engineers	092	Marine engineers and naval architects
	084	Bioengineers or biomedical engineers	093	Materials and metallurgical engineers
	085	Chemical engineers	094	Mechanical engineers
	086	Civil, including architectural/sanitary engineers	095	Mining and geological engineers
	087	Computer engineers – hardware	096	Nuclear engineers
	088	Computer engineers – software	097	Petroleum engineers
	089	Electrical and electronics engineers	098	Sales engineers
			099	OTHER engineers
• Engineering Technologists/Technicians/Surveyors	100	Electrical, electronic, industrial, and mechanical technicians	103	OTHER engineering technologists and technicians
	101	Drafting occupations, including computer drafting	104	Surveyors, cartographers, photogrammetrists
	102	Surveying and mapping technicians		
• Farmers/Foresters/Fishermen	110	Farmers, foresters and fishermen		
• Health Occupations	111	Diagnosing/treating practitioners (e.g., dentists, optometrists, physicians, psychiatrists, podiatrists, surgeons, veterinarians)	236	Psychologists, including clinical – <i>Also consider 070 Counselors</i>
	112	Registered nurses, pharmacists, dieticians, therapists, physician assistants, nurse practitioners	113	Health technologists and technicians (e.g., dental hygienists, health record technologists/technicians, licensed practical nurses, medical or laboratory technicians, radiological technicians)
			114	OTHER health occupations
• Lawyers/Judges	120	Lawyers, judges		
• Librarians/Archivists/Curators	130	Librarians, archivists, curators		
• Managers and Supervisors, First-Line	<i>Find the category on page 16 or 17 that best describes the occupation of the people you manage and select the code</i>			
• Managers, Top-level Executives/Administrators	141	Top-level managers, executives, administrators (e.g., CEO/COO/CFO, president, district manager, general manager, legislator, chancellor, provost)		
• Managers, Other <i>People who manage other managers</i>	142	Computer and information systems managers		
	143	Engineering managers		
	144	Medical and health services managers		
	145	Natural sciences managers		
	146	Education administrators (e.g., registrar, dean, principal)		
	147	OTHER mid-level managers		

JOB CATEGORY (Continued)					
• Management-Related Occupations <i>Also consider 142 to 147 under Managers, Other</i>	151	Accountants, auditors, and other financial specialists	153	OTHER management related occupations	
	152	Personnel, training, and labor relations specialists			
• Mathematical Scientists	171	Actuaries	174	Statisticians	
	172	Mathematicians	175	Technologists and technicians in the mathematical sciences	
	173	Operations research analysts, including modeling	176	OTHER mathematical scientists	
• Physical Scientists	191	Astronomers	195	Oceanographers	
	192	Atmospheric and space scientists	196	Physicists, except biophysicists	
	022	Biochemists and biophysicists	197	Technologists and technicians in the physical sciences	
	193	Chemists, except biochemists	198	OTHER physical scientists	
	194	Geologists, including earth scientists			
• Research Associates/ Assistants	<i>Find the category on page 16 or 17 that comes closest to your research field and select the code</i>				
• Sales/Marketing Occupations	200	Insurance, securities, real estate, and business services	202	Sales occupations – retail (e.g., furnishings, clothing, motor vehicles, cosmetics)	
	201	Sales occupations – commodities except retail (e.g., industrial machinery/equipment/ supplies, medical and dental equip./supplies)	203	OTHER marketing and sales occupations	
• Service Occupations, Except Health <i>Also consider 111 to 114 under Health Occupations</i>	221	Food preparation and service (e.g., cooks, waitresses, bartenders)	223	OTHER service occupations, except health (e.g., probation officers, human services workers)	
	222	Protective services (e.g., fire fighters, police, guards, wardens, park rangers)			
• Social Scientists	231	Anthropologists	236	Psychologists, including clinical – <i>Also consider 070 Counselors</i>	
	232	Economists	237	Sociologists	
	233	Historians	238	OTHER social scientists	
	235	Political scientists			
• Social Workers	240	Social workers			
• Teachers—Precollege	251	Pre-kindergarten and kindergarten	255	Secondary – other subjects	
	252	Elementary	256	Special education – primary and secondary	
	253	Secondary – computer, math, or sciences	257	OTHER precollegiate area	
	254	Secondary – social sciences			
• Teachers/Professors— Postsecondary	271	Agriculture	283	History	
	272	Art, Drama, and Music	286	Mathematics and Statistics	
	273	Biological Sciences	287	Health and Related Sciences	
	274	Business, Commerce, and Marketing	288	Physical Education	
	275	Chemistry	289	Physics	
	276	Computer Science	290	Political Science	
	277	Earth, Environmental, and Marine Science	291	Psychology	
	278	Economics	293	Sociology	
	279	Education	297	OTHER Natural Sciences	
	280	Engineering	298	OTHER Social Sciences	
	281	English	299	OTHER Postsecondary fields	
	282	Foreign Language			
• Teachers—Other	300	OTHER teachers and instructors (e.g., private tutors, dance or flying instructors, martial arts instructors)			
• Writers/Editors/Public Relations Specialists/Artists/ Entertainers/Broadcasters	010	Writers, editors, public relations specialists, artists, entertainers, broadcasters			
• Other Professions	401	Construction and extraction occupations	403	Precision/production occupations (e.g., metal workers, woodworkers, butchers, bakers, assemblers, printing occupations, tailors, shoemakers, photographic process)	
	402	Installation, maintenance, and repair occupations	405	Transportation and material moving occupations	
• OTHER OCCUPATIONS	500	OTHER OCCUPATIONS (Not Listed)			

THANK YOU FOR COMPLETING THE QUESTIONNAIRE.

Please return the completed form within two weeks in the envelope provided.

If you have any questions or need assistance, please visit our SDR website at www.norc.uchicago.edu/sdr, call us toll-free at 1-800-685-1663, or email us at SDR@norc.uchicago.edu. If you cannot find the envelope or would like another, please email or call us.

Our mailing address is:

2015 Survey of Doctorate Recipients
c/o NORC at the University of Chicago
1 North State Street, 16th Floor
Chicago, IL 60602-3305
UNITED STATES OF AMERICA

- Results of the Survey of Doctorate Recipients can be found on the National Science Foundation's website at <http://www.nsf.gov/statistics/doctoratework>.
- You are not required to respond to any information collection unless it displays a valid approval number from the Office of Management and Budget. The approval number for this survey is 3145-0020.

COMMENTS ABOUT THIS SURVEY:

VITA

Lauren Longino Jacobs was born and raised in Sulphur Spring, Texas. She attended Baylor University in Waco, Texas, where she earned a Bachelor of Business Administration degree in Marketing and International Business. During her time as an undergraduate, she studied abroad for a semester in Denmark at the University of Aarhus and worked as an au pair for a summer in Madrid, Spain. After graduation, Lauren attended an informal Spanish language school, La Mariposa, in Nicaragua then returned to the US to earn her Master of Education in Higher Education Administration from the University of North Texas in Denton, Texas. She currently works as a Program Coordinator in the International Programs and Study Abroad Office within the Haslam College of Business at the University of Tennessee, Knoxville.