



# Job satisfaction patterns of scientists and engineers by status of birth<sup>☆</sup>

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## ARTICLE INFO

### Article history:

Received 17 April 2009

Received in revised form 8 March 2011

Accepted 5 April 2011

Available online 8 May 2011

### Keywords:

Foreign-born scientists

Birth status

Job satisfaction

Science and engineering

NSF

Work life

## ABSTRACT

The latest figures published by the Science and Engineering Indicators report reveals that in 2003, 33% of faculty in science and engineering departments at research universities were foreign-born, a number that has more than doubled in thirty years. Foreign-born faculty members comprise an important part of the scientific enterprise that has been understudied. The purpose of this study is to examine the job satisfaction patterns of scientists and engineers by status of birth using a very large and comprehensive National Science Foundation (NSF) dataset, the Survey of Doctoral Recipients (SDR). The results of the study indicate that foreign-born scientists and engineers are less satisfied in several areas of their work life as compared to their US-born peers.

Published by Elsevier B.V.

## 1. Introduction

A growing number of reports from the National Science Foundation and the National Academy of Sciences express concerns over the United States maintaining its lead in the realm of Science and Engineering (S&E). Recent concerns about the US holding its lead in science and engineering fields stem from the fact that the enrollment of the native population in scientific and technological fields is dwindling, and increasingly more doctorate degrees and Nobel prizes are being awarded to foreign-born scientists. At the same time the market for scientists and engineers is growing at a rate of 5% each year, and it is projected that by 2014 colleges, universities, professional and private schools will witness an employment growth of 34.3% (Bureau of Labor Statistics, 2005). To sustain the rise in employment, universities and policy makers have discovered that there is a need to find ways to attract and retain a growing population of foreign-born faculty at universities.

Progress in the fields of S&E in the United States is heavily dependent upon the contributions made by foreign professionals. Native-born Americans constitute only part of the US supply of S&E workers. According to a report by RAND, the two important groups apart from young Americans for conducting research activities in the US are foreign-born students and foreign-trained scientists and engineers (Kelley et al., 2004, p. 39). According to the 2006 Science and Engineering Indicators report by NSF, "In 2003, 28% of all

full-time doctoral S&E faculty and 33% of full-time doctoral faculty in research institutions in the United States were foreign born, up from 21% and 25%, respectively, in 1992. In the physical sciences, mathematics, computer sciences, and engineering, 47% of full-time doctoral S&E faculty in research institutions were foreign-born, up from 38% in 1992" (National Science Board, 2008, pp. 5–30). Among foreign-born faculty in the current study, a majority are of Asian origin (63.5%). Thus, like other sectors of the US economy academia, also has relied upon foreign-born doctoral graduates.

A recent report issued by the Pew Research Center forecasted that one in five Americans (19%) will be foreign-born by 2050, which surpasses the historical wave of immigration of 14.8% set back in 1890 (Passel and Cohn, 2008). Surprisingly, very little research has been conducted to investigate this growing group in the academy. This study thus proposes to fill the gap that currently exists in the literature, by examining the job satisfaction of foreign-born scientists working as faculty members at four-year universities in the US. There is a need to produce more research to add to the body of literature, and identify issues that this growing group of faculty members must address daily. Thus, the primary research question that this study will aim at answering is: Are there differences in the factors that impact job satisfaction of scientists and engineers employed in four-year research universities in the US based on their birth status? This research adds to the limited body of literature that examines the job satisfaction of foreign-born faculty in the American academy.

## 2. Background literature

The growing numbers of foreign-born in the academy has triggered the interest among several scholars in investigating the

<sup>☆</sup> The use of National Science Foundation data does not imply NSF endorsement of the research methods or conclusions contained in this report.

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contributions made by foreign-born faculty members to the scientific growth in the United States (Broad, 2004; Corley and Sabharwal, 2007; Elder, 2005; Levin and Stephan, 1999). However, only a handful of studies have examined the work lives and job satisfaction of these scientists—this study is a step in that direction. Analyzing job satisfaction by birth status is crucial for understanding the unintentional or intentional biases these members are confronted with on a day-to-day basis. Foreign-born faculty on various campuses around the country bring with them knowledge that not only provides diversity of thought, but also supports cultural competence. However, foreign-born faculty members are often combined with race/ethnic categories, and are not examined as a stand-alone group. Understanding job satisfaction rates of foreign-born scientists is important as there is evidence of an increase in return-migration rates among these groups (Finn, 2007; Saxenian, 2002). As the global competition in the arena of science and technology intensifies, the United States is under greater pressure to attract and retain the best scientists and engineers. Lost talent is costly to individuals, academic departments, institutions, and the society as a whole and thus understanding job satisfaction is one way of improving science and higher education in the United States.

### 2.1. Theoretical framework

Over the years several theories have been presented to explain the concept of job satisfaction directly or indirectly. However, the most influential of them is Herzberg et al. (1959) study on job attitudes and performance. They classified work attitudes into two categories: (a) motivators and (b) hygiene factors. The current study will apply Linda Hagedorn's (2000) model to study job satisfaction as it best explains the phenomenon for university faculty members. Hagedorn (2000) applied Herzberg's motivator and hygiene theory to develop a framework that uses several individual and environmental characteristics to explain faculty job satisfaction. She divided the variables that contribute towards faculty job satisfaction into two main categories: (1) mediators and (2) triggers. Mediators are factors that constantly interact with one another to affect a person's level of job satisfaction. Drawing from earlier theories of job satisfaction, Hagedorn further classified mediators into sub-categories: (1) motivators and hygiene, (2) demographics, and (3) environmental conditions.

Triggers are major life events that can alter a person's satisfaction levels at work. Hagedorn defines them as events such as marriage; divorce; career changes; transfer to a new institution; or a change in a person's sense of work place, justice, or an emotional state. In addition to using mediators and triggers as factors impacting job satisfaction, two additional controls that have been shown to impact faculty satisfaction—English language skills and geographic location are used in this study. The following section will provide a brief description of studies that have examined mediators and trigger factors that influence faculty job satisfaction.

### 2.2. Mediators

#### 2.2.1. Motivators and hygiene factors impacting job satisfaction

Motivators and hygiene are factors that are derived from Herzberg's two-factor theory which originally recognized 14 job related factors that caused satisfaction and dissatisfaction at work, but found only achievement, recognition and responsibility at work, and to some extent, salary to impact job satisfaction. Foreign-born faculty members reported working harder and constantly proving their capabilities as researchers, teachers, and colleagues (Basti, 1996; Liu, 2001). Basti (1996) performed a detailed case study on two foreign-born faculty members employed at a research university. One of the foreign-born faculty members was a prolific researcher, but expressed lower satisfaction at work. The profes-

sor published 12 books and authored over 60 articles; in addition she is an editor of a journal and president of a professional association. Although, she has remarkable scholarly achievements she expressed dismay with her salary, tenure process, and collegiality at work—all of which are reported as important factors that impact faculty job satisfaction (Bender and Heywood, 2006; Hagedorn, 1996, 2000; Kalleberg, 1977; Ward and Sloane, 2000; Watson and Meiksins, 1991; Tack and Patitu, 1992). Due to the added stress to perform and excel in their various roles at the university, it can be hypothesized that foreign-born faculty have lower levels of satisfaction as compared with their US-born counterparts.

Rank and tenure are determined to be powerful explanatory variables in measuring faculty job satisfaction (Tack and Patitu, 1992; Ward and Sloane, 2000). Studies have consistently shown faculty of color, women, and foreign-born have struggled to advance up the academic ladder (Antonio et al., 1997; Basti, 1996; Corley and Sabharwal, 2007; Gupta, 2004; Hagedorn, 1996; Laden and Hagedorn, 2000; Menges and Exum, 1983; Perna, 2001; Tack and Patitu, 1992; Toutkoushian, 1999; Turner and Myers, 2000; Varma, 2006). Foreign-born faculty members are less likely to be present in positions of authority and decision-making, a finding especially evident among faculty of Asian origin (North, 1995; Tang, 1993, 1997; Varma, 2006) despite their large numbers in S&E fields.

There is overwhelming evidence that points to the relationship between higher job satisfaction and increased opportunities presented to an employee for career growth (Hackman and Oldham, 1975; Rhodes and Doering, 1983; Spector, 1997). Varma (2006) in her study found that Asian faculty are likely to face glass-ceiling as these individuals are perceived to "lack leadership qualities, have poor language and communication skills, prefer technical positions over management positions, remain outside the old-boys network, and are socially and culturally different" (p. 98). Expanding on previous studies, this research expects foreign-born faculty to be concentrated at lower ranks of the academy and less likely to rise to positions of leadership when compared to native born peers.

Salary has also been consistently used as a barometer to measure status and equity thus impacting satisfaction with work (Bender and Heywood, 2006; Hagedorn, 1996, 2000; Kalleberg, 1977; Ward and Sloane, 2000; Watson and Meiksins, 1991). Academic wages of foreign-born immigrants is an issue under examination by several economists and social scientists (Borjas, 1985, 1994, 1995, 2006; Chiswick and Miller, 1995; Corley and Sabharwal, 2007; Duleep and Regets, 1999; Espenshade et al., 2001; Gupta, 2004; Monks and Robinson, 2000). Monks and Robinson (2000) used 1993 National Study of Postsecondary Faculty (NSOPF) data to show the lag in salary and career outcomes among foreign-born faculty even after controlling for factors such as scholarly productivity, human capital, institutional and personal characteristics. All these studies indicate that foreign-born faculty members are experiencing a wage gap unexplained by any of the human, social, or institutional factors.

#### 2.2.2. Demographics

In studies of faculty satisfaction the most researched variable is gender (August and Waltman, 2004; Bilimoria et al., 2006; Callister, 2006; Hagedorn, 2000; Hult et al., 2005; Okpara et al., 2005; Olsen et al., 1995; Oshagbemi, 1997; Ropers-Huilman, 2000; Sax et al., 2002; Settles et al., 2006; Tack and Patitu, 1992; Ward and Sloane, 2000). Most of the studies have found male faculty to have higher levels of overall job satisfaction as compared with the female faculty. Women who are foreign-born have been shown to have a double-negative effect on their annual earnings, a difference especially marked among highly educated women (Basti, 1996; Beach and Worswick, 1993). Disparities with opportunities for advancement, promotion, tenure, and salary are factors that can impact the job satisfaction of foreign-born women in a negative fashion when

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