

Turnover and Career Outcomes of Scientists and Engineers

by

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ABSTRACT

Previous studies of turnover have focused mainly on factors influencing turnover intention or turnover behavior. Fewer studies delve into career outcomes after individuals' turnover. However, turnover is not the end of the decision-making process. Due to the boundaryless career (Arthur, 1994) and extensive job mobility in the modern workforce (Stewart, 2002), it is timely to know the effect of turnover on individual career involvement. The three essays in this dissertation will delve into turnover and career outcomes using data of the science, technology, engineering, and mathematics (STEM) personnel in the United States. The first essay explores the effect of past voluntary and involuntary turnover on individuals' job satisfaction, salary, and number of people supervised. The second essay compares gender differences in voluntary turnover patterns and the effects of voluntary turnover on career outcomes. The third essay delves into STEM personnel job mobility across the public, private and nonprofit sectors, with a focus on sector switch and job satisfaction change.

DEDICATION

To my beloved parents, Mr. Degang Wang and Mrs. Yueqing Fan.

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CHAPTER 1

INTRODUCTION: A FOCUS ON TURNOVER AND JOB MOBILITY FOR STEM
PERSONNEL

Researchers have put extensive efforts into studying career mobility and turnover during the past decade. The increasingly turbulent economy (Stewart, 2002; Comin & Mulani, 2006; Comin & Philippon, 2005) has led to a large scale of job loss and job reallocation. Companies have replaced full time and permanent workers with part-time and temporary workers due to the high cost of pension plans and health insurance (Feldman & Ng, 2007). Individuals seek new employment opportunities according to their circumstances due to the change of nuclear families (Kirchmeyer, 2006). During the past four decades, turnover and shifts in jobs and careers (Kirchmeyer, 2006; Sullivan, 1999) lead us to focus on the characteristics of the boundaryless career (Arthur, 1994). Individuals can advance their careers through change, including changes that span organizational and career boundaries (Hall, 2002).

Turnover can be both voluntary and involuntary. Involuntary turnover indicates the needs of the organization, which is usually dependent on the employers' decisions, examples include job termination and layoffs. Voluntary turnover is more concerned with employees' own decisions and balance of their interests of whether they want to leave the current job or not (Lee & Mitchell, 1994; Lam, Ng, & Feldman, 2012; Stumpf, 2014). For instance, individuals change jobs due to family-related reasons, or for better pay or working conditions. Individuals can also have external and internal turnover. External turnover refers to individuals who have voluntary job changes that involve changing employers (Ng, Sorensen, Eby & Feldman, 2007). Internal turnover means that individuals change jobs inside an organization (Naumann, 1992).

The dissertation focuses on turnover and career outcomes for individuals based in science, technology, engineering, and math (STEM) fields in the United States. Those scientists and engineers are important for innovation and economic development.

Understanding and strengthening their career pathways and trajectories are important both for the individual and national prosperity and competitiveness (National Science Board, 2014). The dissertation has three essays, with each one provides a specific dimension about the boundaryless career for STEM personnel.

The first essay delves into the effect of voluntary and involuntary turnover and the specific turnover reasons on individuals' career outcomes. Voluntary turnover is positively associated with individuals' career competencies (Direnzo & Greenhaus, 2011). Through changing jobs, individuals experience learning cycles of career exploration, improve their knowledge and skills for the current position. They can also broaden their social networks and have more social resources (Seibert, Kraimer, & Liden, 2001). Individuals can improve their human capital and social capital through job mobility, thus they have a higher level of career competencies. Improved career competencies can lead to better career outcomes, like job satisfaction, salary and number supervised. However, involuntary turnover has cost both for the individuals and the organizations (Karsan, 2007). Individuals might experience job termination or laid off. These experiences may lay a burden on their future career development. Another research question in this essay is that among individuals with different voluntary turnover reasons, are there any differences concerning their career outcomes? My basic argument is that among individuals with voluntary turnover, those who change for job-related reasons are more likely to have better career outcomes (including job satisfaction, salary, and the number of people supervised).

In line with the theme of essay one, essay two further delves with the gender gap concerning voluntary turnover and career outcomes. The research questions are: What are the reasons for voluntary turnover for female and male scientists and engineers? After a

voluntary turnover, is there a gender gap in career outcomes between men and women? Compared to women, men restrict fewer work efforts and make fewer sacrifices regarding family-related issues (Maume,2006). However, women’s careers are more likely to be influenced by marriage and family environment (Han & Moen, 1999). Even for unmarried women who are in dual-career relationships, they tend to make compromises to “trail” their partners in job mobility (Ackers, 2004). Thus, I argue that women are more likely than men to voluntarily change jobs for family, job locations, and working conditions, while men are more likely to have career-related voluntary turnover than women. For career outcomes after voluntary turnover, since female scientists and engineers tend to have family-related turnovers, and these family responsibilities may lay a burden on women, which leads to career interruptions for women (Williams, 2000). Besides, the new employer might have a bias towards women for their job mobility. Thus, I argue that male scientists and engineers are more likely to have better career outcomes (job satisfaction and salary) than females. In this essay, I also hope to see the gender gap in career outcomes for males and females with graduate degrees.

Essay three focuses on job mobility across the boundary of sectors. Employees can move from the private to the public and nonprofit sector. This essay focuses on the career outcomes change after switching sectors. Specifically, the research question is: Do individuals switching from the private sector to the nonprofit or public sector have an increase (or a decline) in job satisfaction compared to those switching jobs within the private sector? Previous studies on sector switch mainly focus on the reasons and motivations of sector switch, namely, why individuals switch sectors. Individuals’ career outcomes after sector switch are largely ignored. My focus in this study hopes to see what the changes in individuals’ career outcomes are after a sector switch. Through sector

switch, individuals not only find a better fit of their values and sector values but also experience the socialization process of the new sector. Different sector switch patterns can also lead to different returns for individuals' career outcomes through these two mechanisms.

The introduction proceeds as follows: the next part provides previous research on the turnover and career outcomes, especially for the STEM workforce. This literature sets the basic dialogue for this dissertation and my study hopes to fill the gap in the current literature. Next, I present contributions of this dissertation, both theoretically and empirically for turnover and career outcome studies. The introduction ends with the limitations of this dissertation and suggestions for future research.

TURNOVER STUDIES

Turnover is well studied in the fields of management, psychology, and sociology. There is extensive literature on turnover and work mobility, I put the previous studies into two categories, namely, (1) antecedents of employee turnover (turnover as the dependent variable), and (2) effects of employee turnover (turnover as the independent variable).

For the first category literature, various factors influence an individual's turnover. I place the factors into macro factors, organizational factors, and individual factors. Macro factors refer to the environmental or economic factors that influence individuals' turnover. Previous studies have shown that individuals are more likely to have voluntary turnover when the local economy is good since the unemployment rate is low and there might be better chances to find new jobs (Cotton & Tuttle, 1986; Park, Ofori-Dankwa, & Bishop, 1994). According to a meta-analysis (Griffeth, Hom, & Gaertner, 2000), perceived alternatives in the job market modestly predict turnover.

For studies on the organizational level, family-friendly policies, such as child care subsidies, have been found to reduce turnover (Lee & Hong, 2011). Human resource management practices in an organization can also influence employees' turnover (Huselid, 1995; Malos & Campion, 2000; Shaw, Delery, Jenkins Jr, & Gupta, 1998). Job satisfaction and turnover intentions are a reflection of employee perspectives about their employment. Employees show higher levels of job satisfaction and reduce turnover intention when their work environment characteristics satisfy their needs (Tarigan & Ariani, 2015). Furthermore, promotion opportunities, work training, higher salary, and better benefits have shown to reduce employees' turnover (Quarles, 1994; Selden & Moynihan, 2000; Curry, McCarragher, & Dellmann-Jenkins, 2005; Shaw et al., 1998).

Third, studies on turnover also focus on individual characteristics. Race and gender have been studied as demographic variables to influence turnover. For example, though there is no consensus in previous studies, the general findings suggest that women are more likely to have voluntary turnover (Cotton & Tuttle, 1986; Hom, Roberson, & Ellis, 2008). If other variables are included, gender is not a very important predictor of turnover (Blau & Kahn, 1981; Kellough & Osuna, 1995). Previous studies also provide evidence for the life-cycle stability hypothesis, which indicates that senior and more experienced employees are less likely to quit (Ng & Feldman, 2009). Moreover, generally speaking, higher educated individuals might have more choices and are more likely to have voluntary turnover and less likely to have involuntary turnover (Kiefer, 1985; Cotton & Tuttle, 1986; Hachen Jr, 1990).

Most turnover studies concerning STEM personnel focus on STEM faculty or doctor level researchers' turnover and retention (Lawrence, Celis, Kim, Lipson, & Tong, 2014; Xu, 2008a; Xu, 2008b; Kaminski & Geisler, 2012; Cantwell, 2011; Cruz-Castro &

Sanz-Menéndez, 2010; Fernandez-Zubieta, Geuna, & Lawson, 2015), while STEM college graduates are largely ignored. Those STEM faculty turnover research also mainly treats turnover as a dependent variable and studies the antecedents of turnover, except few studies focus on the relationship about turnover and productivity for STEM faculty (Cruz-Castro & Sanz-Menéndez, 2010; Fernandez-Zubieta, Geuna, & Lawson, 2015). For antecedents of turnover, gender difference in STEM fields has shown that male and female faculty have similar intentions to retain in the current organization or stay in academia (Kaminski & Geisler, 2012; Xu, 2008a). However, faculty in mathematics leave earlier than other fields in STEM and females leave sooner than male (Kaminski & Geisler, 2012). Also, female faculty are more likely to change positions within academia, their turnover intentions are strongly associated with progression opportunities, research support and free expression of ideas (Xu, 2008a). Another study has shown other factors influencing faculty turnover. Those who have higher organizational commitment and are more satisfied with enough time for research tend to retain in the current job. However, those who are not satisfied with tenure decisions and work evaluations are more likely to leave the current organization (Lawrence et.al., 2014).

In total, compared to studies considering antecedents of employee turnover (turnover as a dependent variable), not a lot of studies pay attention to the effects of employee turnover (turnover as an independent variable). I provide a more thorough literature review of the effects of employee turnover in essay one. But most of the studies of the effects of employee turnover are set under the economic approach, focusing on the effect of turnover on salary; while other perspectives are largely ignored. In this dissertation, beyond salary, I am also interested in the effect of turnover on other career outcomes for STEM personnel, like job satisfaction and the number of people supervised.

CAREER OUTCOMES OF STEM COLLEGE GRADUATES

Career outcomes of college graduates are studied in the economic, educational, sociological, and organizational literature. Different factors are considered in the college graduates' career selections, including gender, age, academic background, major fields, family background, organizational characteristics, and so forth.

Earning power is the most frequently used indicator for college graduates' career success. College major field has been considered as an important factor to influence earning benefits (Thomas, 2000; Roksa, 2005; Roksa & Levey, 2010; Melguizo & Wolniak, 2011; Thomas & Zhang, 2005). Majoring in STEM fields and find a job closely related to college major has shown to improve individuals' economic returns (Melguizo & Wolniak, 2011). Majoring in business, health, and engineering brings more economic benefits for college graduates than other majors (Thomas & Zhang, 2005). Another study also shows the college major and employment sector can interact with each other to have an impact on college graduates' income. College graduates who major in female-dominated fields are more likely to join the public and nonprofit organization after graduation. The public and nonprofit sectors provide more opportunities for professional and managerial positions, while provide a lower level of income for those graduates (Roksa, 2005). Studies also show that different college majors lead to different rates of income growth for college graduates (Roksa & Levey, 2010; Thomas & Zhang, 2005).

Comparing STEM and non-STEM graduates, STEM graduates are more likely to receive a higher payment if their work closely related to major than non-STEM graduates (Xu, 2013). The results show that, on the one hand, STEM graduates value monetary rewards when they choose a career; on the other hand, it also reveals the self-selection bias. STEM personnel value earning benefits when they choose a STEM-related major in

college and continue their careers in STEM fields (Wolniak & Pascarella, 2005). However, for STEM graduates, women are less likely to have major-related jobs than men during the first ten years after graduation (Xu, 2013). For differences in placement outcomes—female STEM graduates are much less likely to enter the industry and more likely to enter academia or government. Females have substantially lower wages, with a larger gap for those entering industry. This difference is due largely to the field of study and disappears controlling for gender interacted with marital status and children (Buffington, Cerf, Jones, & Weinberg, 2016).

Previous studies on career outcomes have focused both on the objective career and subjective career of individuals (Ng, Eby, Sorensen, & Feldman, 2005; Abele & Spurk, 2009). Objective career outcomes mainly refer to indicators of extrinsic rewards or career advancements, such as the hierarchical level in an organization, salary, the rate of movement up to certain positions, and professional honors (Seibert, Kraimer, & Liden, 2001). Subjective career outcomes represent individuals' self-evaluation of their careers (Arnold & Cohen, 2008; Abele & Spurk, 2009). Subjective career success can be multidimensional, measures of subjective career outcomes include career satisfaction, job satisfaction, organizational commitment, professional identification, and so on (Gattiker & Larwood, 1986; Bozionelos, 2004; Ng et al., 2005). To have a full picture of career outcomes for STEM personnel, this dissertation focuses on both subjective and objective career outcomes for STEM college graduates in the United States.

CONTRIBUTIONS

The dissertation contributes to the general literature on job mobility and career success for STEM personnel. Previous literature on job mobility and turnover does not pay enough attention to career outcomes after individuals' turnover. Moreover, we lack

studies on the work characteristics, gender gap, and sector difference for STEM workforce job mobility. Since the United States suffers from STEM workforce shortages, especially in certain fields and sectors (Xue & Larson, 2015; Wright, 2013; Atkinson & Stewart, 2013), learning STEM personnel turnover patterns and career outcomes are beneficial both at the organizational and societal level.

The first essay contributes to the turnover literature by telling apart the voluntary and involuntary turnover effect on STEM personnel career outcomes. It also contributes empirically for human resources management practices in an organization. For those who have involuntary turnover, they tend to have a lower level of salary in the new job. The result might imply that individuals are having a hard time searching for higher-paying jobs. To ensure the quality of living after job termination or lay off, unemployment insurance may serve as a useful policy tool to help them smooth the transition through unemployment. On the other hand, compared to other voluntary turnover reasons, those changing jobs for family-related reasons have lower job satisfaction and salary in the current job. It is better for the organization to provide them with more family-friendly policies, such as allowing people to work at home, bringing their children to work (i.e. child care facilities), and flexible working hours for full or part-time. For those who change jobs for career or professional interest, they are more likely to have lower salaries and positions in the current organization. Human resources management policies might include offering them better progression opportunities and make their work more rewarding.

The second essay shows the gender gap in external and internal voluntary turnover, and career outcomes for male and female scientists and engineers. The results of this paper highlight different turnover reasons and the following gender gap for their

career development. The essay also has some empirical contributions. Compared to male scientists and engineers, female tend to change jobs for amenity and constrains reasons, which may suggest that women value more of better working conditions and family-friendly policies. Organizations should provide such policies to help women prosper in STEM fields. The results also show that females face more difficulties and receive more penalties in external voluntary turnover, which means that women may lack social networks and resources for externally changing jobs. In STEM fields, organizations and employers might need to help women to gain more professional social networks and provide work training to improve female scientists and engineers' human and social capital.

The third essay contributes to the literature on job mobility among sectors, with an emphasis on different switch patterns and their effects on the change in job satisfaction. The essay focuses on those switching from the private to the public and nonprofit sectors. The results of this paper are beneficial for personnel management of the public and nonprofit organizations. The public and nonprofit sector can attract more employees from the private sector by emphasizing the possible increase in satisfaction with job security, benefits, and contribution to society.

Limitations

The dissertation has several limitations. Since the study adopts the NSCG data, in which the questions are not originally designed for this study. Problems for measurement exist for several key constructs in this study. Second, there are some issues with the external validity of the findings in this study. The findings of this study might not be generalizable to individuals outside of STEM fields. The individuals of this study are STEM college graduates or with a graduate degree. Compared to the general population,

this is a relatively highly educated sample. Besides, since the NSCG survey is based in the United States, the findings might not be generalizable to individuals outside the United States. Finally, the dissertation provides several key findings concerning the relationships between turnover and career outcomes. However, I cannot rule out alternative explanations for the findings. Different mechanisms may influence the effect of voluntary and involuntary turnover, the gender gap of turnover, and the effect of sector switch on career outcomes.

Specifically, in the first essay, the question asking the reasons for individual turnover is used to be coded as voluntary or involuntary turnovers. Individuals can choose multiple reasons for turnover and there is no question in the survey asking the primary reason for turnover. Although I delete those who choose job termination and laid off in the voluntary turnover sample, and delete those who choose pay and promotion, career or professional interests change, working conditions, job locations, family-related, and school-related reasons in the involuntary turnover sample, the question in the survey does not directly ask whether the individual has a voluntary turnover or not. Moreover, from the survey question, I cannot have the information on how many times the individuals have changed jobs during a specific period of time.

The second essay does not account for other family characteristics like children or spouse in the analysis of women and men's gender gap concerning turnover reasons and career outcomes. The gender gap might be more complex based on different family circumstances of men and women. Since the survey question does not ask directly the most important reason for individuals to change jobs, I have no information to know the single most important reason to influence women's career outcomes both for the internal and external voluntary turnover.

The third essay also has some problems with measurement. I treat employer size (ranges from 1 to 8) as a continuous variable in the study, assuming that the intervals between each of the eight values are equally spaced. However, each value (from 1 to 8) represents for a different number of people and this could be problematic for not capturing the real size of an organization. The paper also does not provide a whole picture of different mechanisms of sector switch. Other types of sector switch can be switching from the nonprofit to the public or private sector, or from the public sector to the nonprofit or private sector. The different sector switching patterns, like switching from the nonprofit to other sectors or from the public sector to other sectors could provide more insights for sector switch. Moreover, the paper uses cross-sectional data. Multiple switches across sectors through longitudinal studies might provide more interesting and robust results for us to understand sector differences.

Future work

Future research may need to delve into turnover and career outcomes for individuals with more diverse backgrounds beyond STEM college graduates. The results might be quite different for those who are less educated or in other disciplinary fields. Thus, we can have a better understanding of the interplay of individuals' characteristics with their job mobility and career trajectories. We can also do studies beyond the U.S. context and compare the results in different cultures. Different societal and organizational cultures might influence individuals' choice of job mobility. Through comparing the results in the U.S. and other country's results, we can provide a whole picture of the boundaryless careers of individuals in the globalization context (Arthur, 1994).

Future studies might also need to provide better and clear measurement for key constructs, including voluntary turnover, involuntary turnover, internal turnover, external

turnover and different turnover reasons. Only then can we explain the turnover patterns more clearly and explain the mechanisms of the effect of turnover on career outcomes. Through telling apart the mechanisms, future study can contribute more to the theoretical explanations for turnover studies.

Furthermore, we should address the effect of multiple moves on individual careers during a longer period of time. Individuals' careers can be affected by different patterns of mobility and mobility patterns can interact with each other and have an influence on the development of individuals' careers. For example, throughout one's career trajectory, individuals may have multiple voluntary turnover or involuntary turnover. Future studies may need to delve into the effect of different numbers of mixed job changes on career outcomes. The effect of job mobility patterns may vary based on individuals' career stage. Those who are in the early career stage might suffer less from involuntary turnover and gain more benefits through voluntary turnover. Through studying the cumulative effect of different turnover patterns, gender gaps, and move across sector and field boundaries, we will have a better understanding of STEM personnel career trajectories and provide policy recommendations accordingly.

CHAPTER 2

ESSAY 1: A LONGITUDINAL STUDY OF TURNOVER AND CAREER

OUTCOMES: EVIDENCE FROM STEM FIELDS

INTRODUCTION

Previous studies of turnover have focused mainly on factors influencing turnover intention or turnover behavior. Fewer studies delve into career outcomes after individuals' turnover. However, turnover is not the end of the decision-making process. Due to the boundaryless career (Arthur, 1994) and extensive job mobility in the modern workforce (Stewart, 2002), it is timely to know the effect of turnover on individual career involvement. There has been conflicting evidence towards the effect of turnover on individuals' career outcomes. Studies have shown that voluntary turnover is positively related to objective career success, such as salary and promotion (McLaughlin, 1991; Keith & McWilliams, 1997; Amuedo-Dorantes & Serrano-Padial, 2007; Feldman & Ng, 2007). Besides, evidence also shows that career stability is positively related to one's emotional stability and core self-evaluations, which predict better career outcomes like a higher level of job satisfaction and pay (Judge & Hurst, 2008). Involuntary turnover, on the other hand, might be harmful for individuals' career development (Karsan, 2007). To further clarify the relationships, this essay focuses on the effect of turnover on career outcomes for individuals, both voluntarily and involuntarily.

What is the effect of voluntary and involuntary turnover on career outcomes? Among individuals with different voluntary turnover reasons, are there any differences concerning their career outcomes? This paper attempts to answer the above questions and contribute to the literature in several aspects. First, this study uses turnover behavior data of individuals. Most previous studies have focused on turnover intention instead of turnover behavior. However, turnover intention might not be a good proxy of turnover behavior (Cho & Lewis, 2012). Second, most previous studies focus on turnover as a dependent variable, looking at factors influencing individuals' turnover. This study

delves into both voluntary and involuntary turnover as predictors of career outcomes and career development. Third, though there are some studies focusing on turnover and career outcomes (Stumpf, 2014; Lambert et al., 2012), most of the studies focus on salary instead of job satisfaction or number supervised after individuals' turnover. Moreover, this is, at least to my knowledge, the first study using panel data and fixed effect models to delve into the above questions.

This paper takes advantage of the panel data of the National Survey of College Graduates (NSCG) in the United States. The individuals in this survey are mainly based in science, technology, engineering, and math (STEM) fields. The reasons for focusing on scientists and engineers in STEM are quite simple: they are critical to innovation. Evaluating, supporting, and strengthening STEM workforce pathways is critical to both the individual and national prosperity and competitiveness (National Science Board, 2014).

The paper is organized as follows. First, I review the previous research on turnover and career outcomes. Based on the literature review and theory, I propose the main hypotheses for the paper. Next, I discuss the details of the data and the regression results. Finally, I draw conclusions and discuss the theoretical and practical implications of this study.

LITERATURE REVIEW

This literature review mainly focuses on the effect of turnover on individuals' career outcomes. The positive relationship between turnover and objective career success (e.g. salary) has received general support from the previous literature. Studies have shown that compared to workers who are laid off or discharged, individuals who voluntarily change their jobs have better payment (McLaughlin, 1991; Keith &

McWilliams, 1997). There are also some studies tell apart the effect of external turnover and internal turnover on objective career success. External turnover refers to voluntary job changes that involve changing employers (Ng, Sorensen, Eby & Feldman, 2007), while internal turnover is about changing jobs inside an organization (Naumann, 1992). Previous empirical research supports that external turnover leads to higher salary (Topel & Ward, 1992; Amuedo-Dorantes & Serrano-Padial, 2007; Sturman, Walsh & Cheramie, 2008). For example, Topel and Ward's (1992) research has shown that in the first decade of the career development of young men, one third of the total salary growth comes from job changes. On the other hand, external salary usually increases faster than internal salary, individuals could have better payment due to external turnover than those who only stays in one organization (Hammida, 2004; Feldman & Ng, 2007). Individuals who only stays in one organization might face more difficulty to get promoted internally than their more mobile counterparts, especially for individuals at the top management positions. Thus, external turnover could be beneficial for individuals to reach a higher hierarchical position than embeddedness is (Baruch & Peiperl, 2003; Feldman & Ng, 2007). For specific turnover reasons, employees who quit for dissatisfaction with pay enjoy a higher level of payment after turnover than those who quit for nonpecuniary reasons (Akerlof, Rose, Yellen, Ball & Hall, 1988). Keith and McWilliams (1997) show that employees who quit for family-related reasons have lower level of salary growth than those who quit for non-family-related reasons and non-movers.

Currently, not a lot of studies focus on the relationship between turnover and subjective career success (e.g. job satisfaction). According to Feldman and Ng (2007), for turnover studies concerning career success, we need to tell part the occupational turnover and organizational turnover. For occupational turnover, those who have embedded in

their jobs for a longer period of time are more likely to have a higher level of job satisfaction. On the other hand, under the attraction-selection-attrition paradigm (Schneider, Goldstein & Smith, 1995), those who are most unhappy with their occupations would leave the occupations eventually (Feldman & Ng, 2007). For inter-organizational turnover, the influence of turnover on subjective career success depends on the motivation of changing jobs (Kondratuk, Hausdorf, Korabik, & Rosin, 2004). For example, if individuals change organizations voluntarily due to promotion opportunities, it is more likely that they will have a higher level of job satisfaction (Arthur, Khapova, & Wilderom, 2005). However, if individuals having inter-organizational turnover for escaping the current stressful environment, then individuals might accept the new jobs hurriedly even though the new jobs are slightly superior to the current ones. Under these circumstances, we would not expect that turnover has a much positive effect on subjective career success (Feldman & Ng, 2007). In a study adopting the data collected from professionals participating in a part-time MBA program, however, there is no significant relationship between job turnover (including occupational and inter-organizational turnover) and subjective career success (Stumpf, 2014).

To date, not enough studies focus on the effects of employee turnover. Salary is the main concern; however, job satisfaction and number supervised are largely ignored. Through changing jobs, individuals experience short learning cycles, which could have an impact on their job trajectories and future turnover decisions (Fuller, 2008). Due to the boundaryless career and extensive job mobility occurred in current work force (Stewart, 2002), more research should delve into the mechanisms of turnover and the effect of turnover on the development of individuals' careers. Instead of using cross-sectional data in most of the previous studies, this paper utilizes panel data of scientists and engineers,

in hoping to delve into how turnover might influence the future development of one's career, including job satisfaction, salary and number supervised.

THEORY AND HYPOTHESES

Individuals advance their career success through mobility. According to Hall (2002), traditional career path of staying in one organization during one's whole life is replaced by "protean careers", which means that individuals have identity change and continuous learning cycles to improve their employability. Individuals nowadays are more likely to pursue psychological success instead of job security (Hall, 2002).

Human capital theory (Becker, 1994) stresses that through changing jobs and working in multiple organizations or positions, individuals accumulate knowledge, skills and experiences to handle work tasks. The learning cycles during job change generally help them to gain human capital. The accumulated human capital, thus, would improve their career competencies.

Social capital theory (Granovetter, 1973) can also predict the relationship between voluntary turnover and career outcomes. Integrating the previous studies, social capital can be both the social networks that facilitate or impede the mobility of social resources and the social resources that imbedded in the networks (Seibert, Kraimer, & Liden, 2001). Through changing jobs, individuals expand their social networks with new colleagues, leaders, subordinates, customers, and other professional networks. The expanded social networks may provide them with more information and social resources in job search. Social resources have also been found to be positively related to career success, such as salary, promotions, career satisfaction, and occupational status (Seibert, Kraimer, & Liden, 2001; Lai, Lin, & Leung, 1998).

Voluntary turnover is positively related to career competencies (Direnzo & Greenhaus, 2011). Through changing jobs, individuals experience learning cycles of career exploration, improve their human capital and social capital, thus they have a higher level of career competencies. Improved career competencies can lead to better career outcomes, like job satisfaction, salary and number supervised.

Although admitting the necessity of separate analysis of voluntary and involuntary turnover, most of the previous studies only focus on voluntary job changing or do not tell apart the two different job changing patterns (Rosenfeld, 1992). Involuntary turnover has cost both for the individuals and the organizations (Karsan, 2007). Contract termination or layoffs can have negative effects on individuals. For example, this experience may lay a burden on the individual and influence their future job choice and career outcome. Having been laid off may also cause their new employers treating them unfairly. Thus, I have the following hypotheses:

H1A: Individuals with voluntary turnover are more likely to have a higher level of job satisfaction.

H1B: Individuals with involuntary turnover are more likely to have a lower level of job satisfaction.

H2A: Individuals with voluntary turnover are more likely to have a higher level of salary.

H2B: Individuals with involuntary turnover are more likely to have a lower level of salary.

H3A: Individuals with voluntary turnover are more likely to have a larger number of people they supervise.

H3B: Individuals with involuntary turnover are more likely to have a smaller number of people they supervise.

Different types of voluntary turnover can have various returns on career outcomes. Separating turnover by motivation may help us understand the reasons and the

turnover effect more clearly. According to Bartel and Borjas (1981), there are two types of turnover. One type is job-related, the other is not job-related. For the first type, individuals change jobs for the dissatisfaction with the current job, for example, the poor working conditions, the low payment, or the poor job match, and so forth. The second type of turnover is non-job-related, which includes quitting the current job for family or education reasons, such as taking care of family members, transferring a job together with a spouse, or pursuing a new Master's degree. The two types of turnover lead to different effects on individual career outcomes. One explanation is concerning the pre-separation job search (Keith & McWilliams, 1997). Individuals quitting for personal and non-job-related reasons, such as some random events (e.g. family member's illness), might not be well prepared and devoted for job search. They have experienced less learning cycles and career exploration than those quitting for job-related reasons. In addition, non-job-related job changes may also impede individuals from finding matched and satisfactory jobs. Thus, I have the following hypotheses concerning job-related voluntary turnover.

H4A: Among individuals with voluntary turnover, those who change for job-related reasons are more likely to have a higher level of job satisfaction.

H4B: Among individuals with voluntary turnover, those who change for job-related reasons are more likely to have a higher level of salary.

H4C: Among individuals with voluntary turnover, those who change for job-related reasons are more likely to have a larger number of people they supervise.

DATA AND METHOD

Our data comes from the National Survey of College Graduates (NSCG), which has been conducted since the 1970s by the U.S. National Science Foundation. The survey focuses on the nation's college graduates in science and engineering disciplines and

samples individuals under the age of 76 who are living in the United States during the reference period. The survey shows the information on work activities, occupation, salary and demographic information about college-educated individuals. Since the sampling frame of the NSCG has changed since 2010, and due to data access limitation, this study only adopts 2010, 2013 and 2015 surveys for panel data analysis. The sample of voluntary turnover has 192,672 observations across the three time periods, while the sample of involuntary turnover has 160,463 observations across the three time periods¹.

In the survey, turnover is measured by the following question. I coded the question to treat turnover as a dummy variable. Answer of 1 is coded as not having turnover while other answers mean having turnover (answer 2, 3, and 4).

During these two time periods – ... – were you working for...

1. *Same employer and in same type of job*
2. *Same employer but in different type of job*
3. *Different employer but in same type of job*
4. *Different employer and in different type of job*

For the different reasons for turnover, there is a question in the survey. Answers coded as voluntary turnover reasons include: pay, promotion opportunities; working conditions; job location; change in career or professional interests; family-related

¹ In the voluntary turnover sample, 37,621 individuals only observed in 2010, 18,735 individuals only observed in 2013, 26,477 individuals only observed in 2015. In total, 82,833 individuals only observed once. In the fixed effect regression model, the observations then should be $192,672 - 82,833 = 109,839$. In the involuntary turnover sample, 36,854 individuals only observed in 2010, 20,907 individuals only observed in 2013, 27,854 individuals only observed in 2015. In total, 85,615 individuals have only one observation across the three time periods. Thus, in the fixed effect regression model, the observations should be $160,463 - 85,615 = 74,848$.

reasons; school-related reasons. However, laid off or job terminated are involuntary turnover reasons.

Why did you change your employer or your job? (multiple answer question)

1. *Pay, promotion opportunities*
2. *Working conditions*
3. *Job location*
4. *Change in career or professional interests*
5. *Family-related reasons*
6. *School-related reasons*
7. *Laid off or job terminated (includes company closings, mergers, buyouts, grant or contract ended)*
8. *Retired*
9. *Some other reason*

There are about 20% of individuals who have voluntary turnover during the time of the survey years. There are about 4% of individuals who have involuntary turnover during the time of the survey years. Table 1 shows the descriptive statistics of the target population of voluntary turnover. Table 2 shows the descriptive statistics of the involuntary turnover.

For voluntary turnover characteristics, there are six reasons concerning voluntary turnover. Pay and promotion opportunities are the most popular reasons, which account for 69% of the whole observation of voluntary turnover. Working conditions account for 46%, job location accounts for 32%, and interest changes account for 39%. Respondents who choose family and school-related reasons are 16% of the voluntary turnover individuals. For demographics, nearly 46% of the respondents are women. Minority individuals account for 21% of the whole population, including American Indian/Alaska Native, Hispanic, Black, Native Hawaiian/Other Pacific Islander, and people who regard themselves as “multiple race”. The average age of the sample is 45 years old². Moreover,

² In both the voluntary and involuntary sample, I only kept the respondents who are 25-75 years old. Because 25-75 is the working age range and those people are the main workforce in the job market.

69% of the individuals are married and 44% have children at home, and 76% of the respondents are US-born. Half of the surveyed population have bachelor's degrees, 37% of the respondents have a master's degree, 8% have a doctoral degree, while 5% have a professional degree. Respondents work in three sectors, with 65% working in the private sector, 22% in educational institutions like two or four-year colleges, and 13% in government. There are seven discipline affiliations of the individuals in the sample, 9% working in computer science and math, 4% in biology and life sciences, 11% in engineering, 17% in other science and engineering related fields, 36% in non-science and engineering related fields, and 3% in both physical and social science fields. For the career-related variables, on average, the number of hours worked per week is 42 hours. Job fit is measured by using the extent of the individual's work on principal job related to the highest degree. It is measured through the Likert scale from not related to closely related (1 to 3). Moreover, 54% of individuals have attended work training in their principal job. For job benefit, most people have health insurance, pension plans and paid vacation, but only 26% of the individuals have profit sharing. The annual salary of the respondents is \$81,591. For job satisfaction, the survey uses a Likert scale from very dissatisfied to very satisfied (from 1 to 4). Number supervised is measured using the number of people that the individual supervises, including supervising directly and through subordinates. On average, one individual supervises about 10 others in the principal job.

-----Table 1 here-----

In the involuntary turnover sample, 45% of the individuals are female, 21% are from minority groups. The average age is 47 years old. Most people (70%) are married and 44% have children at home, and 76% are born in the United States. For education

degree types, about half of the respondents are bachelors, 36% are masters, 8% are doctors, and 5% have a professional degree. The three employer sector percentages are the same as the voluntary turnover sample. The discipline affiliations are also similar to the voluntary turnover sample, with 8% of the respondents from computer science and math, 4% from biology, agriculture, and other life sciences, 3% from physical science, 3% from social science field, 11% in engineering, 16% in other science and engineering related fields, and 34% from non-science and engineering related fields. The average working hours per week is about 42 hours. The average job fit is 2.49, and about half of the respondents (52%) received work training. Most people have pension plans, health insurance, and paid vacation as benefits of the job. However, only 26% of the individuals have profit sharing in their current job. For career outcomes of the involuntary turnover sample, the average annual salary is \$82,472. Job satisfaction is 3.31 on average. The average number of every respondent supervising is 9.55.

-----Table 2 here-----

To understand the effect of past turnover on future career outcomes, the study first uses the pooled OLS Model for analysis. Y means career outcomes of the individual, including job satisfaction, salary, and number supervised. TO means the voluntary or involuntary turnover. X stands for control variables including demographic characteristics, highest degree type, number of work hours, job fit, and work disciplinary affiliation.

$$(1) \quad Y_{it} = \alpha_0 + \alpha_1 TO_{it} + \alpha_2 X_{it} + \varepsilon_{it}$$

Despite the richness of the control variables, there may well be other unmeasured characteristics that influence career outcomes and cannot be controlled in the regression model. If these characteristics are correlated with voluntary turnover (or involuntary

turnover), then the estimated career outcomes will be biased. For example, if some employees have higher work abilities and motivation, the employees may want to change jobs for better career development, and the career outcomes for these people are better compared to people who do not have voluntary turnover. This unobserved difference will result in an upward bias in voluntary turnover behavior. In this case, it will be the unobserved work abilities and ambitious motivation that leads to better career outcomes instead of voluntary turnover per se. The above unobserved individual characteristics can be absorbed in the individual fixed effect model. With time going by, the panel data may also have aggregated year effect. So, I also include the year dummy in the model. In the following equation of the fixed effect model, μ stands for individual fixed effect, γ stands for year fixed effect common to every individual, while other variables are the same with the above pooled OLS model.

$$(2) \quad Y_{it} = \alpha_0 + \alpha_1 TO_{it} + \alpha_2 X_{it} + \mu_i + \gamma_t + \varepsilon_{it}$$

RESULTS AND DISCUSSION

The study first runs the regression of voluntary/ involuntary turnover and career outcomes. Comparing the pooled OLS and the fixed effect model, we can find that voluntary turnover improves job satisfaction extensively while involuntary turnover leads to a lower salary and a smaller number of people supervised. Then, the study delves into the specific voluntary turnover reasons and career outcomes using the same two models.

Specifically, past voluntary turnover improves job satisfaction in both the pooled OLS and the fixed effect model³ (Table 3). In the fixed effect model, there is no

³ See Appendix A, Table A3 for the full model.

significant relationship between past voluntary turnover and salary or number supervised. Comparing the coefficients in the two models, in sum, the pooled OLS model downplays the effect of voluntary turnover on job satisfaction. Thus, hypothesis 1A is supported, while hypothesis 2A and 3A are not supported. Voluntary turnover leads to better subjective career success (e.g. job satisfaction) for several reasons. Individuals usually voluntarily change jobs due to the new position having more rewards than their current jobs. And individuals often have high expectations of job satisfaction when they enter a new job, and they are more likely to raise the evaluations of the new job to justify the sacrifices that they have made to leave the previous occupations. Thus, subjective career success (e.g., job satisfaction) tend to have a positive relationship with voluntary turnover (Feldman, 2002; Feldman & Ng, 2007).

-----Table 3 here-----

Table 4 shows that past involuntary turnover leads to a lower salary and a smaller number supervised in the fixed effect model⁴. However, there is no significant relationship between past involuntary turnover and job satisfaction. Hypothesis 2B and 3B are supported while hypotheses 1B is not supported. Involuntary turnover impedes individuals' objective career success for several reasons. Individuals might not be able to find a perfect match in the current job and new employers may have a bias due to the individuals laid off or job terminated experiences. Involuntary turnover can lay a burden on individuals to find a new job, lower their new job salary and impede their supervisory position.

-----Table 4 here-----

⁴ See Appendix A, Table A4 for the full model.

Table 5 shows the specific reasons for voluntary turnover and career outcomes⁵. Different motivations for voluntary turnover have various returns. Job-related voluntary turnover reasons include pay, promotion opportunities; working conditions; job location; and change in career or professional interests. Non-job-related voluntary reasons include family-related and school-related reasons. All the job-related voluntary turnover improves individual's job satisfaction. While changing jobs due to family-related reasons are not conducive to the improvement of job satisfaction compared to other voluntary turnover reasons. Non-job-related reasons, such as family and school-related reasons, lead to a significantly lower level of salary in the fixed effect model, suggesting individuals might not be prepared for job searching for higher-pay jobs. The results of changing in career or professional interest turnover are quite interesting and mixed. Job satisfaction of changing interest is significantly improved compared to other reasons for voluntary turnover. However, changing interest can lead to a lower level of salary and a smaller number supervised, respectively. The results may suggest that individuals follow their interest and passion to improve their subjective success, while entering a new field or area of interest increases the learning cost, and the individuals might need to start from a lower position in the new job. There is a trade-off between the subjective and objective success of changing for career interest. In the fixed effect model, except for changes in career or professional interests, other reasons for voluntary turnover do not have a significant relationship with number supervised. Taken together, the results show that hypothesis 4 is partly supported. Individuals changing for job-related reasons tend to

⁵ See Appendix A, Table A5 for the full model.

have a higher level of job satisfaction. Thus, hypothesis H4A is supported. However, those changing for job-related reasons have mixed career outcomes concerning salary and number supervised.

-----Table 5 here-----

CONCLUSION

Using panel data and fixed effect model, this study contributes to the turnover literature by explaining the influence that the enactment of turnover has on the evolvement of individual careers. Results show that past voluntary turnover is beneficial to subjective career success (like job satisfaction); while past involuntary turnover impedes objective career success (like salary and number supervised). For different kinds of voluntary turnover reasons, job-related voluntary turnover improves individuals' job satisfaction; while non-job-related reasons, such as family and school-related reasons, lead to a lower level of salary compared to job-related reasons.

Based on the above results, I propose policy implications concerning this paper. As my study shows, individuals with involuntary turnover have a lower level of salary in the new job, which may suggest that individuals are having a hard time searching for higher paying jobs. Measures should be taken to ensure their quality of living after job termination and lay off. For example, unemployment insurance may serve as a useful policy tool, especially for young workers. They may experience more turnover in the future due to boundaryless careers and they have little means to smooth the transition through unemployment (Michelacci & Ruffo, 2015).

Learning individuals' past work experiences, like turnover and the specific reasons, are beneficial for human resources management practices in the organization. Compared to other voluntary turnover reasons, those changing jobs for family-related

reasons have lower job satisfaction and salary in the current job. Employees need support from the current organization for their objective and subjective career success. Since individuals might experience random events like family-member illness, family-friendly policies should be implemented to help those employees prosper. Specific measures include allowing people to work at home, bringing their children to work (i.e. child care facilities), and flexible working hours for full or part time.

In addition, individuals changing career or professional interest tend to have lower salaries and positions in the current organization. These employees follow their interests for the new job. Human resources management policies might include offering them better progression opportunities and consulting their new experiences on how to make work more rewarding.

There are limitations to this current study. For instance, since the study adopts the NSCG data, the original questions in the survey were used to construct the variables in this study. In the survey, there is no question directly asking whether the individual has a voluntary turnover or not. Therefore, the question asking the reasons for individual turnover was used to be coded as voluntary or involuntary. And the result of this study might not be generalizable to other groups of individuals beyond STEM fields.

Previous literature mainly focuses on turnover or career success as outcomes separately. Obviously, these results interact with each other and future research should provide a better explanation for various career patterns and mechanisms. Moreover, we should also address the effect of multiple moves on individual careers, especially in a longer term. Only then can we understand the complex dynamics of career change and development.

Table 1 Descriptive Statistics for Voluntary Turnover

Variable	N	Mean	SD	Min.	Max.
<i>Independent variable</i>					
voluntary turnover	192,672	0.20	0.40	0	1
<i>Reasons of voluntary turnover</i>					
Pay, promotion opportunities	39,484	0.69	0.46	0	1
Working conditions	39,484	0.46	0.50	0	1
Job location	39,484	0.32	0.47	0	1
Change in career or professional interests	39,484	0.39	0.49	0	1
Family-related reasons	39,484	0.16	0.37	0	1
School-related reasons	39,484	0.16	0.36	0	1
<i>Demographic characteristics</i>					
Female	252,465	0.46	0.50	0	1
Minority	252,465	0.21	0.41	0	1
Age	252,465	45.31	13.89	25	75
Squa age	252,465	2,245.65	1,325.87	625	5,625
Married	252,465	0.69	0.46	0	1
Place of birth	252,465	0.76	0.43	0	1
Children at home	252,465	0.44	0.50	0	1
<i>Educational characteristics</i>					
<i>Education degree type</i>					
Bachelor	252,465	0.50	0.50	0	1
Master	252,465	0.37	0.48	0	1
Doctorate	252,465	0.08	0.27	0	1
Professional	252,465	0.05	0.22	0	1
<i>Employer characteristics</i>					
<i>Sector</i>					
Educational institutions	206,893	0.22	0.41	0	1
Government	206,893	0.13	0.33	0	1
Private business	206,893	0.65	0.48	0	1
<i>Discipline affiliations</i>					
Computer science and math	252,465	0.09	0.28	0	1
Biological, agricultural, and other life sciences	252,465	0.04	0.19	0	1
Physical science	252,465	0.03	0.17	0	1
Social science	252,465	0.03	0.17	0	1
Engineering	252,465	0.11	0.32	0	1
Other S and E related	252,465	0.17	0.37	0	1
Non S and E related	252,465	0.36	0.48	0	1
<i>Career-related variables</i>					
Hours work per week	206,893	42.28	12.12	1	96
Job fit	206,893	2.49	0.72	1	3
Work training	251,219	0.54	0.50	0	1
Health insurance	206,893	0.85	0.36	0	1
Pension plan	206,893	0.74	0.44	0	1
Profit sharing	206,893	0.26	0.44	0	1
Paid vacation	206,893	0.83	0.37	0	1
<i>Dependent variables</i>					
Salary	206,893	81,590.51	82,621.22	0	1,223,166
ln(Salary)	206,893	10.97	1.15	0	14.02
Job satisfaction	206,893	3.32	0.72	1	4
Number supervised	252,465	10.04	121.67	0	10,296

Table 2 Descriptive Statistics for Involuntary Turnover

Variable	N	Mean	SD	Min.	Max.
<i>Independent variable</i>					
Involuntary turnover	160,463	0.04	0.20	0	1
<i>Demographic characteristics</i>					
Female	220,305	0.45	0.50	0	1
Minority	220,305	0.21	0.41	0	1
Age	220,305	46.84	13.84	25	75
Squa_age	220,305	2,385.85	1,337.55	625	5,625
Married	220,305	0.70	0.46	0	1
Place of birth	220,305	0.76	0.43	0	1
Children at home	220,305	0.44	0.50	0	1
<i>Educational characteristics</i>					
<i>Education degree type</i>					
Bachelor	220,305	0.51	0.50	0	1
Master	220,305	0.36	0.48	0	1
Doctorate	220,305	0.08	0.26	0	1
Professional	220,305	0.05	0.22	0	1
<i>Employer characteristics</i>					
<i>Sector</i>					
Educational institutions	174,686	0.22	0.42	0	1
Government	174,686	0.13	0.33	0	1
Private business	174,686	0.65	0.48	0	1
<i>Discipline affiliations</i>					
Computer science and math	220,305	0.08	0.27	0	1
Biological, agricultural, and other life sciences	220,305	0.04	0.19	0	1
Physical science	220,305	0.03	0.17	0	1
Social science	220,305	0.03	0.17	0	1
Engineering	220,305	0.11	0.32	0	1
Other S and E related	220,305	0.16	0.37	0	1
Non S and E related	220,305	0.34	0.47	0	1
<i>Career-related variables</i>					
Hours work per week	174,686	42.10	12.25	1	96
Job fit	174,686	2.49	0.72	1	3
Work training	219,059	0.52	0.50	0	1
Health insurance	174,686	0.84	0.37	0	1
Pension plan	174,686	0.74	0.44	0	1
Profit sharing	174,686	0.26	0.44	0	1
Paid vacation	174,686	0.83	0.38	0	1
<i>Dependent variables</i>					
Salary	174,686	82,471.96	85,161.44	0	1,223,166
ln(Salary)	174,686	10.97	1.17	0	14.02
Job satisfaction	174,686	3.31	0.72	1	4
Number supervised	220,305	9.55	120.30	0	10,296

Table 3 Voluntary Turnover and Career Outcomes

	Job satisfaction	Model 1		Job satisfaction	Model 2	
		Salary	Number supervised		Salary	Number supervised
Voluntary turnover	0.05*** (0.00)	-0.01** (0.01)	2.60*** (0.81)	0.19*** (0.01)	0.00 (0.01)	-1.66 (1.14)
Observations	192,672	192,672	192,672	109,839	109,839	109,839
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 Involuntary Turnover and Career Outcomes

	Job satisfaction	Model 1		Job satisfaction	Model 2	
		Salary	Number supervised		Salary	Number supervised
Involuntary turnover	-0.21*** (0.01)	-0.01 (0.01)	-1.37 (1.69)	-0.00 (0.01)	-0.05*** (0.02)	-3.77* (2.19)
Observations	160,463	160,463	160,463	74,848	74,848	74,848
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 Voluntary Turnover Reasons and Career Outcomes

	Job satisfaction	Model 1		Job satisfaction	Model 2	
		Salary	Number supervised		Salary	Number supervised
<i>Reasons of voluntary turnover</i>						
Pay, promotion opportunities	0.10*** (0.01)	0.14*** (0.01)	5.33*** (1.48)	0.09*** (0.02)	0.12*** (0.03)	2.39 (4.02)
Working conditions	0.03*** (0.01)	-0.02*** (0.01)	-8.38*** (1.32)	0.21*** (0.02)	-0.02 (0.03)	-5.02 (3.56)
Job location	0.00 (0.01)	0.01 (0.01)	-0.72 (1.43)	0.04* (0.02)	0.02 (0.03)	-3.52 (3.67)
Change in career or professional interests	0.07*** (0.01)	-0.07*** (0.01)	-3.78*** (1.31)	0.09*** (0.02)	-0.05** (0.02)	-6.72* (3.46)
Family-related reasons	-0.04*** (0.01)	-0.07*** (0.01)	-1.39 (1.88)	-0.08*** (0.03)	-0.06* (0.03)	-7.25 (4.95)
School-related reasons	0.02* (0.01)	-0.16*** (0.01)	0.04 (1.98)	0.06* (0.03)	-0.10*** (0.04)	-3.08 (5.42)
Observations	39,484	39,484	39,484	39,484	39,484	39,484
Mean VIF	7.32	7.26	7.33	7.32	7.26	7.33
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 3

ESSAY 2: VOLUNTARY TURNOVER AND CAREER OUTCOMES OF FEMALE
AND MALE SCIENTISTS AND ENGINEERS

INTRODUCTION

Science, technology, engineering, and mathematics (STEM) workforce are crucial for the development and prosperity of national innovation and economy. Among the STEM workforce, women are significantly underrepresented, although they account for nearly half of the general workforce (Beede et al., 2011). The underrepresentation of women pursuing STEM education degrees and continuing STEM careers may impede the development of STEM fields, also lay a negative effect on equality and equity for the work environment. To help women prosper in STEM fields, we need to better understand their career trajectories and factors influencing their career outcomes. In today's workforce, turnover is becoming more and more common (Arthur, 1994; Stewart, 2002). Women in STEM fields can have both external and internal voluntary turnover. It is important for us to understand the reasons behind these job mobility patterns and their effects on career outcomes. If there is a gender gap in career outcomes due to voluntary turnover, policies should be implemented both at the organizational and societal level to facilitate women's career change and development.

Previous studies have mostly looked into the gender gap concerning turnover and salary in the general workforce. Few studies focus on this issue in STEM fields. To further delve into these questions, this paper hopes to answer: What are the voluntary turnover reasons for female and male scientists and engineers? After voluntary turnover, is there a gender gap in career outcomes between men and women? The paper adopts the National Survey of College Graduates (NSCG) for analysis. The study will first compare two categories of voluntary turnover reasons, namely the career-oriented and amenity/constraints reasons of female and male scientists and engineers. Then, the study will compare men's and women's career outcomes after external or internal voluntary

turnover. Last, the specific voluntary reasons and career outcomes will be provided to show the nuances of the results.

The paper is organized as follows. The next part is the literature review. I provide a general picture of gender differences towards turnover and career outcomes, and what has been studied in STEM fields. In the theory and hypotheses part, I provide the theoretical explanations for four hypotheses. Then, I will show the data and method part, followed by the results and discussion part. Finally, I summarize the findings in the conclusion part and point out the policy implications for this paper.

LITERATURE REVIEW

Gender Differences in Turnover Patterns

Previous studies have shown different turnover patterns based on gender and other individual characteristics. Studies have found mixed results for men and women's mobility patterns. Generally speaking, women are more likely than men to have job mobility (Light & Ureta, 1995; Hsueh & Tienda, 1996).

Specifically, Keith and McWilliams (1995) distinguished four types of reasons for job mobility for men and women, including layoffs, discharged or fired, family reasons, and other reasons. The results show that there are gender differences concerning turnover patterns. Compared to women, men are more likely to have involuntary turnover. Women, on the other hand, are seven times more likely to have family-related job mobility. Royalty (1998) distinguishes job-to-nonemployment from job-to-job turnover. Women, on average, have more job-to-nonemployment mobility than men, while less job-to-job turnover than men. The turnover patterns of highly educated women are similar to those of men. However, less educated women are significantly different from men or highly educated women in turnover behaviors. Reasons for turnover mainly

include leaving for better job opportunities or simply because people have no choice (Royalty, 1998). Fuller (2008) provides a detailed picture of turnover patterns for men and women over time. In the beginning phase of their careers, both men and women experience a higher level of turnover and the rate is declining with time going by. Generally speaking, men are more likely to experience more discharges and layoffs, less family-related turnovers than women. The gender gap is relatively small. Considering tenure for the job, few people stay with the original employer (3% for men and 4% for women). However, more than 20% of men and women have turnover once or twice during the twelve years since starting their careers (Fuller, 2008).

Gender Differences in Turnover and Career Outcomes

Previous empirical research mainly focuses on the gender gap of turnover and salary, excluding other career outcomes. Although the general literature supports the positive relationships between turnover and salary (Amuedo-Dorantes & Serrano-Padial, 2007; Sturman, Walsh, & Cheramie, 2008; Topel & Ward, 1992), there are nuances concerning the gender gap. In the first ten years of the career development phase for young workers, male workers gain one-third of their salary increase from turnover (Topel & Ward, 1992). However, another study found that, on average, women gain 50 percent less salary increase when changing jobs compared to men (Loprest, 1992).

Women, on the other hand, may have worse career outcomes after job change (Brett & Stroh, 1997; Keith & McWilliams, 1995; Valcour & Tolbert, 2003). Fuller (2008) provides detailed information concerning women's family characteristics. She found that women in marital status or having children are more likely to experience a lower salary than men do. Unmarried women and those without children are not experiencing the wage penalty due to family-related turnovers. One possible explanation

is women have fewer job searches than men while they are employed (Keith & McWilliams, 1995). The current studies do not include job searches in the comparison of cumulative turnover results by gender. Thus, it would be hard for us to determine what the actual situation is (Fuller, 2008).

Another explanation for women's salary penalty is from the perspective of social network theory. Social networks and social connections can provide individuals with information about job vacancies and whether they are suitable for the application (Granovetter, 1995). However, network resources may not help men and women equally (Fuller, 2008). Men are more likely in a superior position than women in negotiation salaries because men usually have more networks and connections with higher-level or management positions (Dreher & Cox, 2000). Women, on the other hand, lack support from social networks professionally.

Women's Underrepresentation and Gender Gap in STEM Fields

Previous studies have shown that women are underrepresented in STEM fields, both in obtaining STEM degrees and working for STEM jobs (Planty, Kena, & Hannes, 2009; Morganson, Jones, & Major, 2010; Beede et al., 2011; Xie, Shauman, & Shauman, 2003). Although female workforce contributes half to the US economy, only 25% of those jobs in STEM are female workers. In general, women are less likely to choose a STEM major in college than men. Even for those who have received a STEM degree, only 26% of women will continue working in STEM jobs while 40% of men will stay pursuing their STEM careers (Beede et al., 2011). Several explanations exist for the lack of female workforce in STEM fields. First, according to social role theory and the intrinsic gender differences, women are thought to take more family-related responsibilities and the self-selection effect can lead women not to pursue STEM degrees

and careers (Xu, 2015; Staniec, 2004; Perna, 2001). Women also face structural and organizational obstacles to pursue a career in male-dominated fields (Xu, 2015). Women may lack support from female managers, receive lower salary and promotion opportunities (Bentley & Adamson, 2003). There can be social and political bias towards women in STEM fields. All the above factors can set the obstacles for women choosing STEM degrees and careers.

The gender gap concerning career outcomes also exists in STEM fields. According to the research by Xu (2015), there are two potential and conflicting explanations for the salary gap in the STEM fields: female graduates have experienced formal and informal organizational mechanisms, leading to disadvantages in terms of income and promotion opportunities (Bentley & Adamson, 2003). Another explanation is based on women's intermittent occupational patterns. Women's occupational interruption due to childbirth and family-related responsibilities may be harmful to them to accumulate job experiences and reduce the returns on human capital. Nevertheless, there is not enough evidence and research to tell apart these two explanations and future studies need to further address the causes of the gender gap in STEM fields.

Summary

Summarizing the previous literature, I find that current studies focusing on the gender difference in turnover patterns and the different effects of turnover on salary. Salary is the main concern for career outcomes. However, the subjective career outcomes (like job satisfaction) are mainly ignored for individuals who have changed jobs. Do individuals have a higher level of job satisfaction after voluntary turnover? What is the difference between men and women?

More importantly, the current literature focuses on the general workforce job mobility, what is the situation in STEM fields? Since the STEM fields lack the female workforce and the gender gap concerning career outcomes might be bigger in STEM fields, what is the turnover patterns and the effect of turnover on career outcomes in STEM fields? Among the few studies of turnover and career outcomes in STEM fields, most of the studies focus on faculty or doctoral level personnel (Xu, 2008a; Xu, 2008b; Cruz-castro & Sanz-menéndez, 2010; Lawrence et al., 2014), while a large amount of STEM personnel with bachelor's degrees are ignored.

It's worthwhile to focus on this gap in the literature. In STEM fields, women might face more difficulties in searching for jobs and receive support on the job market. Women lack social networks, connections, and resources for improving their career outcomes after turnover, and they may face more prejudice in male-dominated fields (Xu, 2017; Xu, 2015; Dasgupta & Stout, 2014; Fuller, 2008). Thus, this study hopes to find whether there is a gender gap for women's job mobility reasons and patterns. After women's turnover, whether they gain fewer benefits than men or not. The findings of this study will improve our understanding of female scientists and engineers' voluntary job switch, work-life balance, and how to gain better career outcomes after voluntary turnover.

THEORY AND HYPOTHESES

According to Robst (2007), reasons for individuals to choose a job can be divided into two categories: career-oriented and amenity/constraints. Career-oriented reasons include changing jobs for pay, promotion, and career interests. Amenity related reasons include changing jobs for job locations, working conditions, and family-related reasons, which reflect individuals' personal preference of the job characteristics. However, at the

same time, these amenity related reasons may reflect the constraints in the job search. In job searches, women tend to face more constraints than men do. For example, according to social role theory (Eagly, 1987), women have the primary responsibility for caring for their families. Compared to men, marriage and family environment have a greater influence on the career development trajectory of women (Han & Moen, 1999). Women who are married, thus, tend to face more constraints concerning working locations and conditions for job search and mobility. Moreover, even before the stage of marriage and parenting, unmarried female scientists in dual-career relationships also tend to make compromises in their job mobility and career development to “trail” their partners (Ackers, 2004). Prioritizing their partners’ job and career development can make women face more constraints for working locations and conditions. Compared to men, women also receive less support for job change from their own households (Hardill, 2002). Thus, women may be more likely to change jobs for job locations and working conditions to have more flexibility for taking care of family members.

Men, on the other hand, restrict fewer work efforts for the sake of family-related issues (Maume, 2006). During employment, men are more likely to have more job searches than women (Keith & McWilliams, 1999) and are in a better position to find more suitable occupations or better opportunities to change for higher salary or promotion. Women usually take more work breaks, work part-time and exist the workforce for family-related reasons (Fuller, 2008). Considering voluntary turnover of female and male scientists and engineers, I have the following hypotheses:

H1A: Female scientists and engineers are more likely to have voluntary turnover due to amenities-related reasons compared to male scientists and engineers.

H1B: Male scientists and engineers are more likely to have voluntary turnover due to career-oriented reasons compared to female scientists and engineers.

As I mentioned above, women are more likely to have voluntary turnover due to family-related reasons. Women's family-related turnovers might lead to lower returns towards career outcomes. Women might need to spend more time and energy in taking care of family members or their partners. These kinds of family responsibilities may lay a burden on women, which leads to career interruptions for women (Williams, 2000). These interruptions may also reduce women's access to employment information and opportunities for job searches. It is more likely that women cannot find a better fit for their jobs compared to men who will have more opportunities for job search.

After women change jobs, the new employer might have a bias towards them. Employers might perceive women who change jobs as less dedicated to their previous job or have a lower level of career competencies. Motherhood status can make evaluations towards women worse compared to considering the single-gender factor. These kinds of biases are more likely for mothers looking for new jobs after previously exiting the workforce (Ridgeway & Correll, 2004). Some studies even find that career change can have a negative impact on women's career outcomes (Gottschalk, 2001; Fuller, 2008), while the same penalty does not exist for men.

For example, Fuller (2008) has shown that women's mobility has a negative impact on salary. Women who are married tend to experience less-favorable mobility-salary outcomes. My hypothesis is that there is still a positive relationship for female scientists and engineers. However, compared to male scientists and engineers, the returns of voluntary turnover are lower for females. Fuller's (2008) research mainly focuses on individuals with lower levels of education. Most of the respondents in the sample have

relatively lower education levels. For example, in the group of four years of potential experience, 7.2% of women had high school dropout (less than 12 years' education), 65.4% of women went to high school, while only 27.4 % of women received a college education. For more educated women, the difference in turnover between men and women is not that much. Since my study focuses on female and male scientists and engineers, both of whom have received a college education, my hypothesis is that there is still a gap between the two, but the gap is relatively small compared to individuals with less education.

Evidence has shown that all else being equal, women with STEM jobs earn more than the comparable women in non-STEM jobs (Beede et.al., 2011). The gender wage gap is also smaller in STEM jobs than in non-STEM jobs (Beede et.al., 2011). Though previous studies mainly focus on the salary difference between men and women, other career outcomes like job satisfaction could also be influenced by women's inferior positions in job search and mobility. Based on the previous arguments, I have the following hypotheses:

H2A: Compared to female scientists and engineers, male scientists and engineers are more likely to have a higher level of increase in job satisfaction after voluntary turnover.

H2B: Compared to female scientists and engineers, male scientists and engineers are more likely to have a higher level of increase in salary after voluntary turnover.

In the third hypothesis, I argue that there is a three-way interaction between voluntary turnover, gender, and graduate degrees to have an impact on career outcomes.

More educated men have higher levels of human capital and social capital. On the one hand, if men invest more in education, training and the improvement of their skills,

which can lead to better career outcomes than those who invest less in education. Another perspective is that more educated men gain more social capital through the different breadth and depth of social relationships. The indispensable role of social networking in improving career development has been extensively studied (Wolff & Moser, 2009; Bozionelos & Wang, 2006; Sagas & Cunningham, 2004; Seibert, Kraimer, & Liden, 2001). Moreover, female graduates' job satisfaction is slightly lower than male graduates' job satisfaction in their early career stages (Bönte & Krabel, 2014). In STEM fields, female graduates earn 31 percent less than male graduates overall (Buffington, Cerf, Jones, & Weinberg, 2016). Male graduates tend to have better career outcomes than female graduates, especially in STEM fields. Based on the previous arguments that male is more likely to have a higher level of increase in job satisfaction and salary than female after voluntary turnover, male scientists and engineers with graduate degree will strengthen the effect of voluntary turnover career outcomes. Thus, I have the following hypotheses:

H3A: Male graduates who have voluntary turnover are more likely to have a higher level of increase in job satisfaction than female graduates who have voluntary turnover.

H3B: Male graduates who have voluntary turnover are more likely to have a higher level of increase in salary than female graduates who have voluntary turnover.

DATA AND METHOD

The data come from the 2013 and 2015 National Survey of College Graduates (NSCG). As previously noted in the first essay, the survey consists of STEM college graduates' demographic, educational, and work-related variables. To have a better understanding of gender differences among individuals who have voluntary turnover

from 2013 to 2015, the sample of this study is divided into two parts. The external voluntary turnover sample includes those who do not change jobs and those who have changed jobs externally. The internal voluntary turnover sample consists of those who do not change jobs and those with internal voluntary turnover. Tables 6 and 7 provide the summary statistics for the external and internal turnover sample respectively.

-----Table 6 here-----

Voluntary turnover is measured using the following question in the NSCG survey. The answer 1 to this question is coded as not changing jobs; answer 2 is coded as internal voluntary turnover; answer 3 and 4 are coded as external voluntary turnover.

- During these two time periods – ...– were you working for...*
1. *Same employer and in same type of job*
 2. *Same employer but in different type of job*
 3. *Different employer but in same type of job*
 4. *Different employer and in different type of job*

The external voluntary turnover sample consists of 61,534 observations, while the internal voluntary turnover consists of 56,305 observations. As we can see from Table 6, among those 61,534 individuals, 16% have changed their jobs voluntarily and externally from 2013 to 2015. From table 7, 8% of the people have internal voluntary turnover. For those who have changed jobs, the most popular reason is for pay and promotion opportunities, and the least popular reasons are school-related and family-related reasons respectively in the two samples. More than half of the people in the two samples are men. Most of the individuals in the two samples are married (69% vs. 70%). More than half (52% vs. 51%) of the respondents have a graduate degree. It is measured by the question asking the individual what is his or her highest degree. The answer ranges from bachelor, master, doctorate, and professional degree. Master, doctorate and professional degrees are coded as having the graduate degree. The variable degree job fit measures to what extent

individuals' highest degree related to their principal job (the answer is a Likert scale ranging from 1 to 3). Most of the survey respondents (66% and 65% respectively in the two samples) work in the private sector. Employer size is a continuous variable that ranges from 1 to 8, with 1 representing 10 or fewer employees, while 8 for more than 25000 employees. For work activity, 31% of the individuals in the whole external voluntary turnover sample work in management and administration positions (33% in the internal voluntary turnover sample), 22% work for research and development, 13% for teaching, and 7% for computer applications. For their work discipline affiliations, most people work in non-S and E related work. The working hours for individuals range from 1 to 96 hours per week. Tenure is measured by how many years the individuals have worked for their principal job. Work training is a dummy variable of whether the individual has attended the work training or not. Other job-related benefits include if they have health insurance, profit sharing, and paid vacation. For the dependent variables, the measure of job satisfaction is a Likert scale range from 1 to 4 (very dissatisfied to very satisfied). Salary is the annual salary of the individual. The descriptive details are shown in Table 6 and 7.

-----Table 7 here-----

I first use two sample T test for the comparison of men and women's voluntary turnover reasons in the two sample sets for external and internal turnover both for married and unmarried individuals. Then, I used hierarchical ordinary least squares regression with robust standard errors to run the regression for job satisfaction and salary to test the hypotheses.

RESULTS AND DISCUSSION

To compare gender differences of voluntary turnover reasons, I use two sample T test for men and women's external and internal voluntary turnover reasons. Table 8 shows the final results. As we can see, in the external voluntary turnover sample, female scientists and engineers (both married and unmarried) are more likely to change jobs for family-related reasons than males. For the unmarried group, female is also more likely to change for working conditions. Thus, my hypothesis H1A is partly supported. On the other hand, male scientists and engineers are more likely to change jobs due to pay and promotion opportunities, and also for career and professional interests change in the external voluntary turnover sample. The results support my hypothesis H1B.

-----Table 8 here-----

Among those who have internal voluntary turnover (IVT), the results are different from the external voluntary turnover (EVT). For those who are married and with internal voluntary turnover, women are more likely than men to change jobs for working conditions and family-related reasons. However, married men are more likely to internally change jobs for job locations than married women. The gender difference in career-related turnovers is not significant in the internal voluntary turnover sample. For those who are unmarried and with internal voluntary turnover, the different turnover reasons do not show a statistically significant difference between men and women. Summarizing the two samples' findings, in the external voluntary turnover sample, H1A is partly supported and H1B is supported while in the internal voluntary turnover sample, H1A is only partly supported and H1B is not supported.

I then run the regression model for job satisfaction and salary both in the external and internal voluntary turnover sample. As shown in table 9, model 1 shows the results for the robust OLS of external voluntary turnover and job satisfaction. In model 2, the

interaction of external voluntary turnover and gender was entered. To further test the relationship of gender, marriage and external voluntary turnover, a three-way interaction is included in model 3. Model 4 adds the three-way interaction of external voluntary turnover, gender and graduate degree to test hypothesis 3. Control variables included in the models are individuals' demographics, educational, employer and career-related characteristics. Educational characteristics include whether individuals have a graduate degree⁶ or not, and education degree and job fit. Employer characteristics include employer size, sector, work activity, and work discipline affiliations. Career-related variables include hours of working, years of tenure, work training, and different kinds of job benefits⁷.

-----Table 9 here-----

Model 1 of Table 9 shows that there is a significant positive relationship between external voluntary turnover (EVT) and job satisfaction. In model 2, the interaction effect of gender and EVT is negatively related to job satisfaction, which means that there is a gender difference concerning EVT and job satisfaction. Compared to female, male scientists and engineers are more likely to have a higher level of increase in job satisfaction. The result supports my hypothesis H2A. After adding marriage to the three-way interaction, the result is not significant. For individuals with a graduate degree, model 1 shows that those with a higher level of degree are more likely to have a lower level of job satisfaction; while in model 4, after adding the three-way interaction, it shows

⁶ Graduate degrees include master, doctorate and professional degrees.

⁷ See Appendix B, Table B9 for the full model.

no significant results, which means that there is no gender gap of female and male with the graduate degree for EVT and job satisfaction. Thus, hypothesis H3A is not supported.

Table 10 shows the results of EVT and salary⁸. Model 1 shows a significant and positive relationship between EVT and salary. After adding the interaction term of EVT and gender, however, there is no significant relationship between the interaction term and salary. Thus, hypothesis H2B is not supported in the external voluntary turnover sample. Model 4 adds the three-way interaction of EVT, gender, and graduate degree, which shows there is no significant relationship between the interaction term and salary and H3B is not supported.

-----Table 10 here-----

In the internal voluntary turnover (IVT) sample, IVT is positively related to job satisfaction⁹. Model 2 of Table 11 shows the interaction effect of IVT and females on job satisfaction. The result reveals that female scientists and engineers with IVT are more likely to have a higher level of job satisfaction than male, which contradicts my previous hypothesis H2A. The three-way interactions show no significant relationship with job satisfaction. Thus, hypothesis H3A is not supported for no gender gap between female graduates and male graduates considering IVT and job satisfaction.

-----Table 11 here-----

Table 12 shows the regression models for IVT and salary¹⁰. Model 1 shows that IVT can lead to a higher level of salary. Females with IVT are more likely to have a

⁸ See Appendix B, Table B10 for the full model.

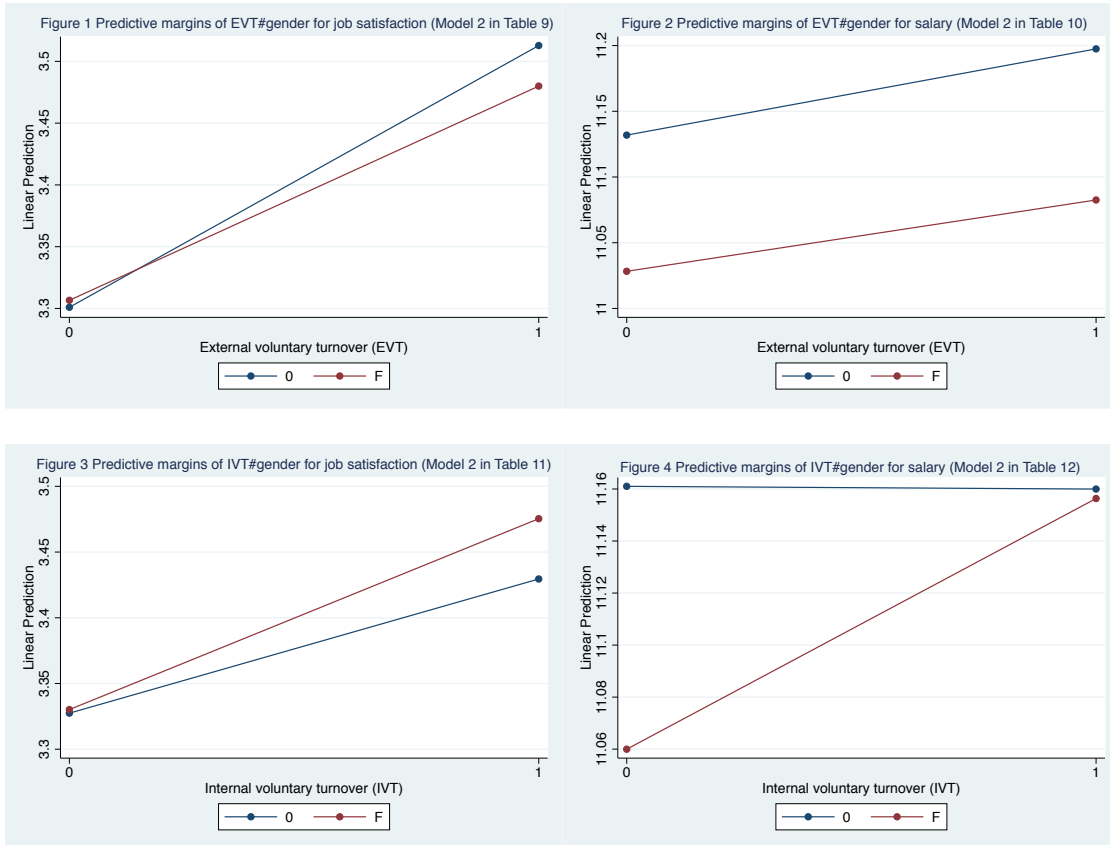
⁹ See Appendix B, Table B11 for the full model.

¹⁰ See Appendix B, Table B12 for the full model.

higher level of salary than males with IVT. Thus, the result in model 2 contradicts my hypothesis H2B. There is no significant relationship between the three-way interaction (including IVT, gender, and marriage) and salary as shown in model 3. In model 4, female graduates are more likely to have a higher level of salary. After adding IVT to the interaction, the result shows that there is no significant relationship between female graduates with voluntary turnover and salary. Thus, H3B is not supported.

-----Table 12 here-----

The figures below show the interaction plots for turnover and gender with career outcomes. Figure 1 is the interaction plot for model 2 in table 9, which reveals the interaction effect of EVT and gender on job satisfaction. Figure 2 shows that there is no interaction effect of EVT and gender on salary. Figure 3 is the interaction plot for model 2 in table 11, while figure 4 represents the interaction effect for model 2 in table 12. From the figures and the above analysis, I draw a conclusion that in the external voluntary turnover sample, H2A is supported while H2B is not supported. Women are more likely to gain a lower level of job satisfaction from external voluntary turnover. In the internal voluntary turnover sample, the results are contradictory with the previous hypotheses H2A and H2B. Women, actually, receive more benefits from internal voluntary turnover than men do. The reasons might be for people who have internally changed their jobs, women do not need to spend much more time and resources for job search. Since women are still in the same organization and work for the same employer, they could suffer less prejudice in changing jobs compared to external voluntary turnover. Women might find a better fit for the new job in the current organization and more benefits.



To further delve into the mechanisms for individuals who have voluntarily changed their jobs, I run robust OLS for different voluntary turnover reasons and career outcomes with the same control variables mentioned above. Table 13 shows the results. For both the external and internal voluntary turnover, and among those who have changed jobs, women who change for working conditions have a higher level of increase of job satisfaction than men do (which contradicts my hypothesis H2A). This is probably due to flexible working hours, better family-friendly policy and more benefits for the job. Women might value more about working conditions, and these improved working conditions can, thus, improve their subjective career success significantly. The result also highlights the importance of improving working conditions for women. Organizations and employers may provide better working conditions for female scientists and engineers

through internal voluntary turnover and make them happier to stay in the current organization, thus improve their organizational commitment. On the other hand, organizations and employers can also attract women to move out of the previous organization by providing them with better working conditions. Moreover, in the external voluntary turnover sample, women who change for family-related reasons enjoy a lower level of salary compared to men.

-----Table 13 here-----

CONCLUSION

Using the National Survey of College Graduates (NSCG) in STEM fields, this study delves into voluntary turnover reasons and career outcomes for female and male scientists and engineers. Results show that both married and unmarried female scientists and engineers are more likely to have family-related external voluntary turnover. Unmarried female also tends to have external voluntary turnover for working conditions. Male scientists and engineers are more likely to have career-related external voluntary turnover than female, such as pay and promotion opportunities, and career and professional interests change. For internal voluntary turnover reasons, married women are more likely than men to have turnover due to working conditions and family-related reasons, while married men tend to change for job locations. Generally speaking, for external voluntary turnover, male scientists and engineers are more likely to change for career-related reasons and female scientists and engineers are more likely to change for amenity and constrains reasons.

For the regression results, female scientists and engineers are more likely to have a lower level of increase in job satisfaction for external voluntary turnover. In the internal voluntary turnover sample, female scientists are more likely to have a higher level of

increase in job satisfaction and salary compared to men after internal voluntary turnover. Moreover, there is no statistically significant gender gap of voluntary turnover and career outcomes for female and male scientists and engineers with graduate degrees in the two sample sets. I further run regressions to have a better understanding of different voluntary reasons and career outcomes. Results reveal that women changing jobs for working conditions are more likely to have a higher level of job satisfaction than men do in both the sample sets. However, for external voluntary turnover, female changing for family-related reasons have a lower level of salary than men do.

I propose some policy implications based on these findings. Since women are more likely to change jobs for amenity/constraints reasons compared to men, employers should provide support for women's working conditions and family-friendly policies. Flexible turnover policies may also be provided to facilitate women's job changing to help them overcome hurdles in transferring and prosper in their career trajectories. The results show that compared to internal voluntary turnover, female scientists and engineers receive lower level of benefits in external voluntary turnover than men do, which means that women may lack social networks and resources for externally changing jobs. In STEM fields, organizations and employers might need to help women to gain more professional social networks and provide work training to improve female scientists and engineers' human and social capital. This study also shows that graduate degrees and higher education may help to reduce the gender gap. Universities and employers should provide more opportunities and access for women in STEM fields to pursue a higher level of degrees and education.

The limitations of this paper are as follows: first, the study does not include other family characteristics like children and spouse in the analysis for gender gap concerning

women and men's turnover and career outcomes. Second, the findings of this study might not be generalizable to individuals outside of STEM fields. The individuals of this study are STEM college graduates or with a graduate degree. Compared to the general population, this is a relatively highly educated sample. Furthermore, the survey question does not ask how many times women or men have changed jobs. It's hard to know what the cumulative effects of external voluntary turnover and internal voluntary turnover in this study are.

The interesting finding of this study is that compared to men, women's increase in job satisfaction and salary are higher in internal voluntary turnover. I do not have enough data to tell how many times women have changed their jobs during the past two years. What are the factors most important for women's gain in career outcomes after internal voluntary turnover? Do women change for better positions and have more promotion opportunities than men do? Or if women find a better fit in the same organization after internal voluntary turnover. Future studies should try to focus on these questions and provide more detailed information. Since the NSCG data will be continually collected, future studies should use the recently collected data and make comparisons with the current study, in hoping to find more robust results.

Table 6 Descriptive Statistics for External Voluntary Turnover

Variable	N	Mean	SD	Min.	Max.
Independent variable					
External voluntary turnover (EVT)	61,534	0.16	0.37	0	1
Reasons of EVT					
Pay, promotion opportunities	9,797	0.68	0.47	0	1
Working conditions	9,797	0.56	0.5	0	1
Job location	9,797	0.42	0.49	0	1
Change in career or professional interests	9,797	0.37	0.48	0	1
Family-related reasons	9,797	0.21	0.41	0	1
School-related reasons	9,797	0.16	0.37	0	1
Demographic characteristics					
Female	79,586	0.47	0.5	0	1
Minority	79,586	0.21	0.41	0	1
Age	79,586	45.21	14.12	25	75
Squa_age	79,586	2,243.68	1,355.97	625	5,625
Married	79,586	0.69	0.46	0	1
Place of birth	79,586	0.77	0.42	0	1
Children at home	79,586	0.43	0.5	0	1
Educational characteristics					
Graduate degree	79,586	0.52	0.5	0	1
Degree job fit	65,745	2.5	0.72	1	3
Employer characteristics					
Employer size	65,745	5.21	2.33	1	8
Sector					
Educational institutions	65,745	0.22	0.41	0	1
Government	65,745	0.12	0.33	0	1
Private business	65,745	0.66	0.47	0	1
Work activity					
Research and Development	65,745	0.22	0.41	0	1
Teaching	65,745	0.13	0.33	0	1
Management and Administration	65,745	0.31	0.46	0	1
Computer Applications	65,745	0.07	0.26	0	1
Other	65,745	0.26	0.44	0	1
Discipline affiliations					
Computer science and math	65,745	0.11	0.31	0	1
Biological, agricultural, and other life sciences	65,745	0.04	0.21	0	1
Physical science	65,745	0.03	0.18	0	1
Social science	65,745	0.04	0.20	0	1
Engineering	65,745	0.14	0.35	0	1
Other S and E related	65,745	0.21	0.41	0	1
Non S and E related	65,745	0.42	0.49	0	1
Career-related variables					
Hours work per week	65,745	42.04	11.9	1	96
Tenure (years)	65,745	8.14	8.31	0	55
Work training	79,190	0.54	0.5	0	1
Health insurance	65,745	0.84	0.36	0	1
Pension plan	65,745	0.75	0.43	0	1
Profit sharing	65,745	0.26	0.44	0	1
Paid vacation	65,745	0.84	0.37	0	1
Supervision	65,745	0.38	0.49	0	1
ln (Salary) (2013)	76,365	10.93	1.16	0	13.96
ln (Salary) (2015)	65,745	11.01	1.13	0	14.02
Job satisfaction (2013)	76,365	3.31	0.72	1	4
Job satisfaction (2015)	65,745	3.31	0.72	1	4

Table 7 Descriptive Statistics for Internal Voluntary Turnover

Variable	N	Mean	SD	Min.	Max.
Independent variable					
Internal voluntary turnover (IVT)	56,305	0.08	0.27	0	1
Reasons of IVT					
Pay, promotion opportunities	4,568	0.79	0.41	0	1
Working conditions	4,568	0.31	0.46	0	1
Job location	4,568	0.15	0.36	0	1
Change in career or professional interests	4,568	0.43	0.49	0	1
Family-related reasons	4,568	0.07	0.25	0	1
School-related reasons	4,568	0.08	0.27	0	1
Demographic characteristics					
Female	74,357	0.46	0.5	0	1
Minority	74,357	0.21	0.4	0	1
Age	74,357	46.02	14.09	25	75
Squa_age	74,357	2,316.58	1,361.16	625	5,625
Married	74,357	0.7	0.46	0	1
Place of birth	74,357	0.77	0.42	0	1
Children at home	74,357	0.44	0.5	0	1
Educational characteristics					
Graduate degree	74,357	0.51	0.5	0	1
Degree job fit	60,516	2.49	0.71	1	3
Employer characteristics					
Employer size	60,516	5.31	2.33	1	8
Sector					
Educational institutions	60,516	0.22	0.41	0	1
Government	60,516	0.13	0.34	0	1
Private business	60,516	0.65	0.48	0	1
Work activity					
Research and Development	60,516	0.22	0.41	0	1
Teaching	60,516	0.13	0.33	0	1
Management and Administration	60,516	0.33	0.47	0	1
Computer Applications	60,516	0.07	0.25	0	1
Other	60,516	0.26	0.44	0	1
Discipline affiliations					
Computer science and math	60,516	0.10	0.30	0	1
Biological, agricultural, and other life sciences	60,516	0.05	0.21	0	1
Physical science	60,516	0.03	0.18	0	1
Social science	60,516	0.04	0.19	0	1
Engineering	60,516	0.15	0.36	0	1
Other S and E related	60,516	0.21	0.41	0	1
Non S and E related	60,516	0.42	0.49	0	1
Career-related variables					
Hours work per week	60,516	42.17	11.82	1	96
Tenure (years)	60,516	8.84	8.38	0	55
Work training	73,961	0.54	0.5	0	1
Health insurance	60,516	0.85	0.35	0	1
Pension plan	60,516	0.77	0.42	0	1
Profit sharing	60,516	0.26	0.44	0	1
Paid vacation	60,516	0.85	0.36	0	1
Supervision	60,516	0.4	0.49	0	1
ln (Salary) (2013)	73,356	10.94	1.16	0	13.96
ln (Salary) (2015)	60,516	11.03	1.11	0	14.02
Job satisfaction (2013)	73,356	3.33	0.71	1	4
Job satisfaction (2015)	60,516	3.32	0.72	1	4

Table 8 Gender Difference of Voluntary Turnover Reasons

Variable	Men	Married sig.	Women	Men	Unmarried sig.	Women
Reasons for EVT						
Pay, promotion opportunities	0.73	***	0.60	0.72	***	0.65
Change in career or professional interests	0.36	**	0.32	0.44	***	0.38
Working conditions	0.55		0.57	0.53	**	0.57
Job location	0.40		0.42	0.41		0.44
Family-related reasons	0.21	***	0.34	0.10	***	0.13
<i>Sample Size</i>	3,116		2,687	1,738		2,256
Reasons for IVT						
Pay, promotion opportunities	0.80		0.77	0.81		0.79
Change in career or professional interests	0.43		0.42	0.42		0.43
Working conditions	0.26	***	0.33	0.35		0.35
Job location	0.16	*	0.13	0.19		0.15
Family-related reasons	0.06	***	0.12	0.02		0.04
<i>Sample Size</i>	1,711		1,309	635		913

*** p<0.001, ** p<0.01, * p<0.05

Table 9 Robust OLS for EVT and Job Satisfaction

Variables	Model 1 Job satisfaction 2015	Model 2 Job satisfaction 2015	Model 3 Job satisfaction 2015	Model 4 Job satisfaction 2015
External voluntary turnover (EVT)	0.19*** (0.01)	0.21*** (0.01)	0.22*** (0.03)	0.22*** (0.02)
EVT × Female		-0.04* (0.02)	-0.04 (0.04)	-0.04 (0.03)
Female × Married			0.04*** (0.02)	
EVT × Married			-0.01 (0.03)	
EVT × Female × Married			0.01 (0.04)	
Female × Graduate degree				-0.02 (0.01)
EVT × Graduate degree				-0.01 (0.03)
EVT × Female × Graduate degree				0.01 (0.04)
Observations	41,016	41,016	41,016	41,016
R-squared	0.25	0.25	0.25	0.25

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10 Robust OLS for EVT and Salary

Variables	Model 1 lnsalary2015	Model 2 lnsalary2015	Model 3 lnsalary2015	Model 4 lnsalary2015
External voluntary turnover (EVT)	0.06*** (0.01)	0.07*** (0.02)	0.09** (0.04)	0.11*** (0.02)
EVT × Female		-0.01 (0.03)	-0.02 (0.04)	-0.06 (0.04)
Female × Married			-0.05*** (0.02)	
EVT × Married			-0.03 (0.04)	
EVT × Female × Married			0.01 (0.06)	
Female × Graduate degree				0.03* (0.02)
EVT × Graduate degree				-0.08** (0.04)
EVT × Female × Graduate degree				0.08 (0.05)
Observations	41,016	41,016	41,016	41,016
R-squared	0.41	0.41	0.41	0.41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11 Robust OLS for IVT and Job Satisfaction

Variables	Model 1 Job satisfaction 2015	Model 2 Job satisfaction 2015	Model 3 Job satisfaction 2015	Model 4 Job satisfaction 2015
Internal voluntary turnover (IVT)	0.12*** (0.01)	0.10*** (0.02)	0.13*** (0.03)	0.11*** (0.02)
IVT × Female		0.04* (0.02)	0.03 (0.05)	0.05 (0.04)
Female × Married			0.04*** (0.01)	
IVT × Married			-0.04 (0.04)	
IVT × Female × Married			0.02 (0.05)	
Female × Graduate degree				-0.02 (0.01)
IVT × Graduate degree				-0.01 (0.03)
IVT × Female × Graduate degree				-0.01 (0.05)
Observations	38,007	38,007	38,007	38,007
R-squared	0.28	0.28	0.28	0.28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12 Robust OLS for IVT and Salary

Variables	Model 1 lnsalary2015	Model 2 lnsalary2015	Model 3 lnsalary2015	Model 4 lnsalary2015
Internal voluntary turnover (IVT)	0.05*** (0.01)	-0.00 (0.02)	-0.02 (0.04)	-0.01 (0.03)
IVT × Female		0.10*** (0.02)	0.09* (0.05)	0.13*** (0.04)
Female × Married			-0.05*** (0.02)	
IVT × Married			0.02 (0.05)	
IVT × Female × Married			0.02 (0.05)	
Female × Graduate degree				0.03** (0.02)
IVT × Graduate degree				0.01 (0.04)
IVT × Female × Graduate degree				-0.05 (0.05)
Observations	38,007	38,007	38,007	38,007
R-squared	0.44	0.44	0.44	0.44

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13 Robust OLS for Voluntary Turnover Reasons and Career Outcomes by Gender

<i>Reasons for EVT</i>	Job satisfaction			Salary		
	Men	Women	Sex difference	Men	Women	Sex difference
Pay, promotion opportunities	0.08** (0.03)	0.04 (0.03)		0.22*** (0.06)	0.14*** (0.04)	
Working conditions	0.10*** (0.03)	0.18*** (0.03)	**	0.01 (0.04)	-0.04 (0.03)	
Job location	-0.03 (0.03)	-0.01 (0.03)		0.01 (0.03)	-0.02 (0.03)	
Change in career or professional interests	0.11*** (0.03)	0.16*** (0.03)		-0.17*** (0.04)	-0.14*** (0.04)	
Family-related reasons	-0.08** (0.04)	-0.02 (0.03)		0.00 (0.04)	-0.12** (0.05)	*
School-related reasons	-0.05 (0.04)	0.05 (0.04)		0.08 (0.08)	-0.05 (0.07)	
Observations	2,944	3,072		2,944	3,072	
<i>Reasons for IVT</i>						
Pay, promotion opportunities	0.14*** (0.05)	0.18*** (0.05)		0.09 (0.06)	0.04 (0.03)	
Working conditions	-0.04 (0.04)	0.02 (0.04)	*	-0.01 (0.04)	-0.03 (0.03)	
Job location	-0.01 (0.05)	0.08 (0.05)		-0.01 (0.07)	-0.00 (0.04)	
Change in career or professional interests	0.06* (0.03)	0.10*** (0.04)		0.01 (0.05)	0.04 (0.02)	
Family-related reasons	0.10 (0.09)	-0.00 (0.06)		-0.13 (0.14)	-0.02 (0.06)	
School-related reasons	-0.09 (0.08)	0.01 (0.06)		-0.17 (0.18)	-0.04 (0.05)	
Observations	1,537	1,470		1,537	1,470	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 4

ESSAY 3: FROM THE FOR-PROFIT TO THE PUBLIC AND NONPROFIT SECTOR: JOB SATISFACTION CHANGE OF SECTOR SWITCHERS

INTRODUCTION

The third essay delves into science, technology, engineering, and mathematics (STEM) personnel job mobility across sectors. Individuals can switch jobs through the public, nonprofit and for-profit sectors. According to Bozeman and Ponomariov (2009), sector switch means when individuals move from the private to the public sector or vice versa. Sector switching is an important issue to study. On the one hand, the public sector in the United States face shortages in certain STEM workforce (Xue & Larson, 2015) and the nonprofit sector has long been challenged by attracting talents (Clerkin & Cogburn, 2012; Kim & Lee, 2007; McGinnis Johnson & Ng, 2016). STEM workforce sector switch studies are related to core issues for the public and nonprofit sectors to attract and retain people (Tschirhart, Reed, Freeman, & Anker, 2008). On the other hand, through studying employees' sector switching behaviors and patterns, we will have a better understanding of the sectoral differences (Bozeman & Ponomariov, 2009).

Previous studies on sector switch mainly focus on the reasons and motivations of sector switch, namely, *why* individuals switch sectors. Individuals' career outcomes after sector switch are largely ignored. My focus in this study hopes to see *what* the changes in individuals' career outcomes are after sector switch. The attraction-selection-attrition and socialization mechanisms are present at the same time in sector switch process, thus can influence individuals' career outcomes. According to attraction-selection-attrition theory, attraction means that individuals choose to work in an organization or sector that best fits their values. Attrition implies that employees leave the organizations or sector that does not fit (Schneider, 1987; Ployhart, Weekley & Baughman, 2006). Socialization, on the other hand, means that employees in an organization may change their attitudes, values,

and behaviors in the direction of organization values after they enter the organization (Chao, O’Leary-Kelly, Wolf, Klein, & Gardner, 1994; Cable & Parsons, 2001; De Cooman et al., 2009). Through sector switch, individuals not only find better fit of their personal values and sector values, but also experience socialization process of the new sector. Different sector switch patterns can also lead to different returns for individuals’ career outcomes through these two mechanisms.

This study aims to delve into the continuity career development for those sector switchers and provide a general picture for sector switching studies. The research question of this study is: Do individuals switching from the private sector to the nonprofit or public sector have an increase (or a decline) in job satisfaction compared to those switching jobs within the private sector? The variable of interest in this study is different dimensions of job satisfaction, including satisfaction with salary, benefit, job security, and contribution to society.

My basic arguments in this paper are: compared to individuals who switch jobs within the private sector, those who leave the private sector for nonprofit or public sector enjoy an increase in job satisfaction towards contribution to society, an increase in job satisfaction towards benefits, an increase in job satisfaction towards job security, but a decline in job satisfaction towards salary. In this paper, I treat individuals who switch inside the private sector as the base group. I hope to compare those who switch inside the private sector with those who move out of the private sector, while all the people in this sample have job mobility during the past two years. The paper will contribute to previous literature on sector switch and our understandings of differences among sectors.

In this paper, I first review some theories concerning sector switch, and literature on motivations of sector switch, mobility, and job satisfaction. Then I provide some

explanations of my hypotheses, followed with data, analysis, and results. Lastly, I provide some discussion on the contributions and limitations of this study, also implications for future studies.

LITERATURE REVIEW

Different sectors and job satisfaction

Job satisfaction of employees plays a vital role in understanding individuals' motivations and commitment to stay in or leave the sector (Borzaga & Tortia, 2006; Su & Bozeman, 2009; Markovits, Davis, Fay, & Dick, 2010). Previous studies have shown mixed results of different sectors and job satisfaction. However, there is consistent evidence that employees in the nonprofit sector have a higher level of job satisfaction compared to employees in other sectors (Borzaga & Tortia, 2006; LeRoux & Feeney, 2013). Among nonprofit organizations, employees in religious nonprofits are most satisfied with their jobs (Borzaga & Tortia, 2006), followed by social cooperatives, and the other nonreligious nonprofits. Considering the public and for-profit sector, most studies have shown that individuals in the public sector are more satisfied with their jobs than private sector employees (LeRoux & Feeney, 2013; Heywood, Siebert, & Wei, 2002); while one study has shown that in social service fields, workers in the public sector enjoy the least satisfaction with their jobs compared to the for-profit and nonprofit sector.

Sector switch

Studies on sector switch have mainly focused on incentives, motivations, and explanations for changing jobs among different sectors. Light (1999) provides various motivations for sector switching, including salary, benefits, job security, opportunity for advancement, personal growth, challenging work, public respect, and so forth. In

addition, Su and Bozeman (2009) focus on incentives of sector switching from the private to the public or nonprofit sector. Their results show that managers have worked in the private sector are more likely to transfer to the public sector job than those who have worked in professional and technical positions. On the other hand, having subordinated in the previous private-sector job are less likely to change to a public sector job. Promotion opportunities are positively related to changing jobs from the private to the nonprofit sector. Public sector employees can also outflow to the private sector. Hansen (2014) has shown that salary, job security, desire for flexible and flat organization, influence on strategic decision making, room for creativity, the benefit of society, and creating values can all be motivations to influence an individual switching to the private sector.

There are also studies about the factors leading employees to shift into or out of the nonprofit sector. Suh (2018) delves into factors leading employees to shift to the nonprofit sector. She finds that for-profit sector employees tend to shift to the nonprofit sector when they are less satisfied with intrinsic rewards. However, individuals working in the public sector tend to switch to the nonprofit sector if they are more satisfied with intrinsic rewards and job reputation. Public sector employees are more likely to stay in the public sector if they are more satisfied with job security in their current jobs (Suh, 2018). Another study shows that for those who have already worked in the nonprofit sector, managers and those with higher levels of education (having a college degree) are more likely to change to other sectors due to low pay (McGinnis Johnson & Ng, 2016). Payment and compensation levels have little impact on non-managers sector-switch intentions.

Summary

Labor economic studies have mainly focus on job mobility among different industry and activities while switching among sectors have been ignored (Su & Bozeman, 2009). Among the few sector switching studies in public and nonprofit management fields, researchers mainly pay attention to the reasons and motivations of sector switch, while employees' career outcomes after sector switch are largely ignored. To fill this gap, this study aims to focus on employees' job satisfaction change after sector switch.

Sector is both a selector and socializer for employees. On the one hand, it attracts employees with certain values. On the other hand, it motivates and satisfies them with particular rewards (Mirvis & Hackett, 1983). Using attraction-selection-attrition and socialization theory, the paper delves into job satisfaction change for those who switch jobs from the private to the public and nonprofit sector. This question is important to study, as most STEM people work for the private for-profit sector (Funk & Parker, 2018) in the United States and the public and nonprofit sector face challenges in attracting talents (Xue & Larson, 2015; Clerkin & Cogburn, 2012; Kim & Lee, 2007). The results of this study might be insightful for the public and nonprofit sector to recruit and retain employees who switched from the for-profit sector, especially for the STEM workforce.

Moreover, this study aims to link the literature among job mobility, sector switch, and employees' job satisfaction together, in hoping to see individuals' career outcomes after sector switch. Thus, this study might contribute to the general literature on boundaryless careers (Arthur & Rousseau, 2001; Arthur, Khapova, & Wilderom, 2005; Sullivan & Arthur, 2006) literature in the current workforce by focusing on individuals' mobility across sector boundaries. By adding more details and nuances about changing jobs among different sectors, this study can also contribute to our understanding of sectoral differences.

THEORY AND HYPOTHESES

Both the attraction-selection-attrition and the socialization mechanisms exist in individuals' sector switch process, thus leading to their career outcomes change. The attraction-selection-attrition theory explains that employees' values and motivations can influence their career change. Individuals who value certain kinds of values tend to find organizations and sectors that best fit their motivations and incentives (Schneider, 1987; Ployhart, Weekley & Baughman, 2006). On the other hand, individuals' values can change due to socialization. Over time, members of the same organization tend to have homogeneous values (De Cooman et al., 2009). For example, Becker and Connor's (2005) study has shown that due to socialization, public and private sector managers' values become more different with their length of tenure in their position. For those sector switchers in my study, they may experience both the attrition and socialization process during job mobility. Sector switchers may find better fit for their values after changing to another sector. Moreover, after entering the new sector and organization, they may experience the socialization process and correspond closely to the new sector. Both of these two mechanisms may change individuals' career outcomes eventually.

Individuals who switch from the private sector to the nonprofit or public sector are more likely to have a higher level of job satisfaction towards contribution to society than those who switch jobs within the private sector. Intrinsic and extrinsic rewards are the two basic rewards for employees at work. Extrinsic rewards include monetary and non-monetary benefits (such as salary, promotion, and job security) (Borzaga & Tortia, 2006; Houston, 2006), while intrinsic rewards that individuals receive from work include positive feelings like autonomy, achievement, social contacts, and opportunities to learn (Lee & Wilkins, 2011; Schepers et al., 2005). Nonprofit and public employees are

believed to value more of intrinsic rewards instead of extrinsic rewards. For example, previous studies have shown that nonprofit employees value responsibility and contribution to society (Johnson & Ng, 2016; Lee & Wilkins, 2011; Su & Bozeman, 2009). In the public sector, employees are more likely to have a higher level of public service motivation (PSM) (Houston, 2000; Perry, 2000). Especially for employees at higher levels in the public sector, they value more about contribution to society (Rainey & Bozeman, 2000). Thus, when individuals change from the private to the nonprofit or public sector, those who value contribution to society might find better fit, do more public work. Moreover, sector switchers may experience socialization process in the new sector, and further change their personal values based on the sector values, and finally have a higher level of job satisfaction towards contribution to society.

H1A: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the nonprofit sector are more likely to have an increase in satisfaction towards contribution to society.

H1B: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the public sector are more likely to have an increase in satisfaction towards contribution to society.

Generally speaking, individuals who work in the private sector earn more than those who work in other sectors. Evidence has shown that for people who are more educated, individuals in the private sector are expected to earn more (Rainey, 2009). Other studies also show that compared to employees in the private sector, those working in the public sector gain a lower level of salary (Adamchik & Bedi, 2000; Dustmann & Van Soest, 1998; Ophem, 1993). For individuals with STEM backgrounds, those majoring in engineering, computer science, and life sciences earn more in the private

sector than in the public and nonprofit sectors (Roksa, 2005). Moreover, there is a difference in financial rewards in the three sectors. Financial rewards include not only salary, but also other types of rewards such as bonuses, salary increases, and performance payment. Compared to nonprofit organizations and the public sector, profits can be allocated to shareholders in the private sector and employees in the private are more likely to receive bonuses and pay by performance. One study has found that employees in the nonprofit and public sector not only receive a lower salary, but also fewer other types of financial rewards like compensation (Ben-Ner, Ren & Paulson, 2011). Limited job promotion opportunities, low salaries are the main reasons why recruitment poses a challenge to nonprofit organizations (Salamon & Geller, 2007). Salary has been found to be an important determinant for employees to classify different sectors (Borjas, 2002) and job choice (Jurgensen, 1978). When individuals move from the for-profit sector to the nonprofit or public sector, it is more likely that they receive a lower level of salary compared to those who switch jobs within the private sector. Thus, they might have a lower level of satisfaction towards salary.

H2A: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the nonprofit sector are more likely to have a decline in satisfaction towards salary.

H2B: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the public sector are more likely to have a decline in satisfaction towards salary.

Benefits are non-monetary value for employees in an organization, including pension, paid leave, health care, and so forth. Compared to switching jobs within the private sector, individuals who switch from the private to the public sector might have a

higher level of job satisfaction towards benefits. Previous research has shown that public sector employees enjoy better pension plans, more paid leaves, and cheaper health benefits than private-sector employees (Moore, 1991). Individuals might move from the private to the public sector to enjoy better benefits regardless of the lower salary. The nonprofit sector also provides better fringe benefits for their employees than the private sector does (Ben-Ner & Ren, 2015). Nonprofit organizations have long been regarded as facing challenges of attracting and retaining talents (McGinnis Johnson & Ng, 2016; Clerkin & Cogburn, 2012; Kim & Lee, 2007). For individuals in STEM majors and with science and engineering backgrounds, the nonprofit sector is more likely to provide competitive compensation to attract those technical and professionals, such as better health insurance, pension plans, and more paid vacation, and so on. Based on the above arguments, I have the following hypotheses:

H3A: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the nonprofit sector are more likely to have an increase in satisfaction towards benefits.

H3B: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the public sector are more likely to have an increase in satisfaction towards benefits.

According to Bozeman and Ponomariov (2009), job security means that employees have the expectation for the stability and continuity of employment in a particular organization. Employees based upon their preferences might be willing to take lower wages in return for greater certainty or stability in terms of employment (Mossholder, Settoon, & Henagan, 2005). Both the nonprofit and public sectors are considered public-serving sectors. When people move from the private sector to the

nonprofit or public sector, they tend to have a higher level of job satisfaction towards job security. Previous studies have shown that public work is attractive to those who value job security (Baldwin, 1990; Houston, 2000; Lewis & Frank, 2002). Employees working for commercial-entrepreneurial nonprofits are also more motivated by issues related to job security (Word & Park, 2015). On the other hand, individuals who value job security may have strong motivations to move to the public and nonprofit sector, they find a better fit in the current job. At the same time, those sector switchers can go through the socialization process in the new sector and value more about job security. Thus, my hypotheses are:

H4A: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the nonprofit sector are more likely to have an increase in satisfaction towards job security.

H4B: Compared to individuals who switch jobs within the private sector, those who leave the private sector for the public sector are more likely to have an increase in satisfaction towards job security.

DATA AND METHOD

The data comes from the National Survey of College Graduates (NSCG), which has been conducted since the 1970s by the U.S. National Science Foundation. This study adopts the 2013 and 2015 surveys for multiple regression analyses. The sample includes individuals who work for the private sector in 2013. Among those individuals, some of them change jobs from 2013 to 2015, either staying in the private sector or switching to

the public and nonprofit sector. The final sample includes individuals with both bachelor and graduate degrees¹¹.

Table 14 shows the descriptive statistics of the whole sample. As we can see, there are 2,561 individuals in the sample who were in the private sector in 2013 and then changed jobs during 2013 and 2015. The majority of people in the sample changed their jobs within the private sector (79%), while 10 % of them changed jobs from the private to the nonprofit sector and 11% switching from the private to the public sector. Most of the individuals in the sample are men (57%) and white (80%), married (57%) and born in the United States (75%).

-----Table 14 here-----

For the measurement, the dependent variables are different dimensions of individuals' job satisfaction change between 2013 and 2015. In both the 2013 and 2015 survey, the question asks:

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 (Likert scale from 1 to 4 to indicate the range from very dissatisfied to very satisfied).

1. *Salary*
2. *Benefits*
3. *Job security*
4. *Job location*
5. *Opportunities for advancement*
6. *Intellectual challenge*
7. *Level of responsibility*
8. *Degree of independence*
9. *Contribution to society*

¹¹ Graduate degrees include masters, doctorates, and professional degrees.

I calculate the job satisfaction change score by subtracting the 2013 score from the 2015 score for different dimensions of job satisfaction. The question below is about the specific sector in which the individual works. The question in the 2013 and 2015 surveys is:

Which one of the following best describes your principal employer during the week of ...? Were you...

Mark one answer.

SELF-EMPLOYED or a BUSINESS OWNER

- 1. in a non-incorporated business, professional practice, or farm*
- 2. in an incorporated business, professional practice, or farm*

PRIVATE SECTOR employee

- 3. in a for-profit company or organization*
- 4. in a non-profit organization (including tax-exempt and charitable organizations)*

GOVERNMENT employee

- 5. in a local government (e.g., city, county, school district)*
- 6. in a state government (including state colleges/ universities)*
- 7. in the U.S. military service, active duty, or Commissioned Corps (e.g., USPHS, NOAA)*
- 8. in the U.S. Federal Government (e.g., civilian employee)*
- 9. ANOTHER type of employee – Specify type of employer*

The answers to this question are coded to construct the sector variable. If the individual's answer is 3, then the individual is coded, currently, as working in the private sector. The answer that equals 4 is coded as the nonprofit sector. If individuals' answer is either 5, 6, 7, or 8, then the individual is coded as working in the public sector.

The external turnover indicator is obtained from the following question:

During these two time periods – ...– were you working for...

- 5. Same employer and in same type of job*
- 6. Same employer but in different type of job*
- 7. Different employer but in same type of job*

8. *Different employer and in different type of job*

I construct the sector switch variable using the above two questions about sector and external turnover. Since all the respondents have been worked in the private sector in 2013, for those who have external turnover and still work in the private sector in 2015, it is coded as switching within the private sector (sector switch=0) during 2013 and 2015. Those who have external turnover and work in the nonprofit sector are coded as switching from the private to the nonprofit sector (sector switch=1). Switching from the private to the public sector (sector switch=2) are people who externally change jobs from the private to the public sector during 2013 and 2015. The question in the survey does not directly asks individuals whether they have job mobility and switched to other sectors. I combined the questions of different employer and employer types together. Thus, it can reduce potential problems of social desirability bias (King & Bruner, 2000), due to which individuals might answer the questions based on what they think is expected from them concerning sector difference and job satisfaction. The construct validity, therefore, can be improved (Shadish, Cook & Campbell, 2002)

Control variables: Despite the demographic characteristics in 2013, I calculate other variables' change scores from 2013 to 2015. The other control variables include educational characteristics, employer characteristics, work activity, and career-related variables.

As Table 14 shows, 3% of the respondents have obtained a higher-level degree than a bachelor's degree from 2013 to 2015. Education degree and job fit is a Likert scale from 1 to 3. The change score of fit ranges from -2 to 2. Employer size is an estimated number of employees working for the principal employer. The size ranges from 1 to 8, with 1 representing for 10 or fewer employees, 2 representing for 11 to 24 employees, 3

representing for 25 to 99 employees, 4 standing for 100 to 499 employees, 5 standing for 500 to 999 employees, 6 representing for 1000 to 4999 employees, 7 representing for 5000 to 24999 employees, and 8 representing for more than 25000 employees. The change score of employer size from 2013 to 2015 ranges from -7 to 7.

Since most of the respondents work in the management and administration (M&A) position or research and development (R&D) position (more than half of the respondents in both the 2013 and 2015 datasets), I construct work activity change from 2013 to 2015. For research and development (R&D), 10% of the individuals move from other positions to R&D (or R&D position to other positions) from 2013 to 2015, while 12% of the respondents stay in the R&D position during job switch. For management and administration positions, 23% of the respondents stay in the position, while 13% of them either move from other positions to M&A or move from M&A to other positions. Career-related variables include the change in working hours per week, change in years of the current position (tenure), change in benefits like health insurance, pension plan, profit sharing and paid vacation, change in the number of people supervised, and also change in salary during 2013 to 2015. Besides, I also use different dimensions of job satisfaction in 2013 as control variables. Controlling for the initial job satisfaction can help to look more closely at *changes* in job satisfaction.

RESULTS

I run the ordinary least squares (OLS) regression with heteroscedasticity robust standard errors for the four dependent variables, including individuals' job satisfaction change with contribution to society, satisfaction change with salary, satisfaction change with benefits, and satisfaction change with job security. Table 15 shows the regression results.

-----Table 15 here-----

Model 1 in Table 15 shows the results for satisfaction change with contribution to society. Compared to individuals who switch jobs within the private sector, those changing jobs from the private to the nonprofit and public sector are having a significant increase in satisfaction with contribution to society. Thus, hypotheses H1A and H1B are supported. Model 2 displays the results of satisfaction change with salary. Compared to those switching from the private to another private organization, those switching to the nonprofit and public sector are more likely to have a decline in satisfaction with salary. My hypotheses H2A and H2B are also supported.

Model 3 predicts the effect of sector switch on satisfaction change with job benefits. Switching to the public sector leads to an increase in satisfaction with benefits than those who switch within the private sector (H3B is supported). However, there is no significant difference in satisfaction change with benefits for those switching to nonprofit than those staying in the private sector. The result implies that my hypothesis H3A is not supported. Model 4 in Table 15 shows that compared to individuals having sector switch within the private sector, those switching to the nonprofit and public sector tend to have an increase in satisfaction towards their job security. These results are in line with my hypotheses H4A and H4B.

The results in Table 15 also highlight some interesting findings of the control variables¹². Improving one's education level (with a graduate degree) is associated with satisfaction decline towards benefits and job security. An increase in education degree and job fit positively relates satisfaction change in contribution to society. Employer size

¹² See Appendix C, Table C15 for the full model.

increase will lead to satisfaction increase with benefits. For work activity, compared to those change jobs in other job positions, those switching from other jobs to R&D tend to have an increase in satisfaction with benefits. Those switching from R&D to other positions are more likely to have a decline in satisfaction with contribution to society, while those stayed in R&D positions have a satisfaction increase with salary and benefits. Moreover, compared to those change jobs in other job positions, those stayed in the management and administration positions are more likely to have an increase in satisfaction with benefit, while a decline in satisfaction with contribution to society. For career-related variables, an increase in working hours is associated with a decline in satisfaction with salary, benefits and job security. A decline in tenure years increases one's satisfaction overall. The result may imply that socialization is most intense when individuals first join an organization (Van Maanen & Schein, 1979; De Cooman et.al, 2009). Generally speaking, the increase in job benefits (health insurance, pension plan, profit-sharing, and paid vacation) is associated with increase in job satisfaction, except that increase in paid vacation is associated with a decline in satisfaction with salary. The change in the number of people supervised is negatively associated with the change in satisfaction with benefits, while salary change is positively related to satisfaction change in salary.

To further understand the gender difference of sector switch and job satisfaction change, Table 16 provides the average marginal effect of sector switch by gender. Previously, table 15 shows that on average, the probability of those switching to the nonprofit sector is 50% higher to have an increase in satisfaction with contribution to society than those switched within the private sector; while the probability of those switched to the public sector is 44% more likely to have an increase in satisfaction with

contribution to society than those switch jobs from one private to another private organization. However, we can expect that the probability of satisfaction change with contribution to society may vary across gender. When we estimate the marginal effect for different gender, we can see that there are some differences between men and women, as shown in Table 16 Model 1. It is 54% points for men and 37% for women who switch from the private to the public sector, and the gender difference is significant ($p < 0.05$). It is 45% points for men and 52% points for women who switch jobs from the private to the nonprofit sector and gender difference is not significant.

-----Table 16 here-----

Model 2 in Table 16 shows the marginal effect of sector switch by gender for satisfaction change with salary. We can see that compared to those who switch jobs within the private sector, the probability of female personnel switching to the nonprofit sector is 26% points (18% points for male) more likely to have a decline in satisfaction with salary. Female switch to the public sector is 23% points (26% points for male) more likely to have a decline in satisfaction with salary. Moreover, the probability of women who switch to the public sector is 14% points higher to have an increase in satisfaction with benefits compared to those switch jobs within the private sector; yet for males both transferring to the nonprofit and public sector, the results are not significant. Lastly, for the marginal effect of satisfaction with job security, compared to those switched to the private sector, men enjoy higher probability (25% vs. 11%) when switched to the nonprofit sector, while the result is not significant for men if switching to the public sector. In total, there is no significant gender difference of sector switch with satisfaction change with salary, satisfaction change with benefits, and satisfaction change with job security.

CONCLUSION

Using STEM personnel sector switch data, this study shows that compared to those who switch within the private sector, individuals who switch from the private to the nonprofit and public sector are more likely to have an increase in satisfaction with the job's contribution to society and job security, and a decline in satisfaction with the job's salary. Those switching from the private to the public sector are also more likely to have an increase in satisfaction with job benefits. The average marginal effect of sector switch on satisfaction change with contribution to society differs by gender. Compared to the base group (those switching within the private sector), men have significantly higher probability to have an increase in satisfaction with job security than women do if they change from the private to the public sector. The marginal effect of sector switch on satisfaction change with job benefits, salary, and job security also differs by gender but the difference is not significant.

Most of previous studies only compare sector differences without considering the dynamics of individuals' job mobility across sectors. However, this study has shown that if individuals leave the private sector for the public and nonprofit sector, they tend to have an increase in satisfaction with job security and contribution to society compared to their counterparts who only switch jobs within the private sector. The paper contributes to the literature on different switch patterns and their effects.

Since the United States suffers from STEM workforce shortages (Xue & Larson, 2015; Wright, 2013; Atkinson & Stewart, 2013), especially advanced-degree holders in the public sector, understanding switching patterns and work mobility behavior and helping STEM graduates to prosper in the workplace are important both at the organizational and national level. Empirically, the public and nonprofit sector can attract

more employees from the private sector by emphasizing the possible increase in satisfaction with job security, benefits, and contribution to society. The analysis and results of this study can provide some insights for the nonprofit and public sector in recruiting, retaining, and providing rewards for their personnel management.

There are limitations to this study. First, employer size is very important to influence other organizational characteristics, such as level of bureaucratization and access to resources, and also very important to control for when distinguishing different sector characteristics (Bozeman & Bretschneider, 1994). However, in this study, there are some problems with the measurement of employer size. I treat the employer size as a continuous variable, assuming that the intervals between each of the eight values are equally spaced. However, each value (from 1 to 8) represents for different number of people and this could be problematic for not capturing the real size of an organization. The number of employees in an organization can be skewed to one end, and I cannot capture some outlier values with simple grouped measure of employer size.

Second, the paper does not offer insights on the different mechanisms of sector switch. Other types of sector switch can be switching from the nonprofit to the public or private sector, or from the public sector to the nonprofit or private sector. These sector switching patterns could provide more insights of sector switch. Third, the paper uses cross sectional data. Multiple switch across sectors through longitudinal studies might provide more interesting and robust results for us to understand sector differences. Future study might need to address more complex switching patterns of employees across a longer period of time, in hope to have a better understanding of their career trajectories and development. Lastly, the sample of this paper is the STEM personnel in the United States. The results and findings from this paper might not be generalizable outside of

STEM fields. Future research should include individuals with more diverse backgrounds and study how their demographic characteristics, motivations, person-organization fit, and occupations jointly affect their job mobility across sector boundaries. This detailed information might help to tell apart the attraction-selection-attrition and the socialization mechanisms on individuals' sector switch patterns and the following effect on career outcomes.

Table 14 Descriptive Statistics for Independent, Dependent and Control Variables

Variable	N	Mean	SD	Min.	Max.
<i>Independent Variable</i>					
<i>Sector Switching</i>					
For-profit	2,561	0.79	0.41	0	1
Nonprofit	2,561	0.10	0.30	0	1
Public	2,561	0.11	0.31	0	1
<i>Dependent Variables</i>					
Job satisfaction change with contribution to society	2,561	0.25	1.04	-3	3
Job satisfaction change with salary	2,561	0.27	0.98	-3	3
Job satisfaction change with benefits	2,561	0.20	1.12	-3	3
Job satisfaction change with job security	2,561	0.16	1.05	-3	3
<i>Demographic Characteristics</i>					
Women (2013)	2,561	0.43	0.49	0	1
Minority (2013)	2,561	0.20	0.40	0	1
Age (2013)	2,561	34.12	8.74	25	66
Squa_age (2013)	2,561	1,240.48	698.9	625	4,356
Married (2013)	2,561	0.57	0.50	0	1
Place of birth (2013)	2,561	0.75	0.43	0	1
Children at home (2013)	2,561	0.37	0.48	0	1
<i>Educational Characteristics</i>					
Graduate degree change	2,561	0.03	0.17	0	1
Degree job fit change	2,561	0.04	0.66	-2	2
<i>Employer characteristics</i>					
Employer size change	2,561	0.11	2.59	-7	7
<i>Work activity</i>					
<i>Research and development (R&D)</i>					
Other work activity (others)	2,561	0.68	0.47	0	1
Others to R&D	2,561	0.10	0.30	0	1
R&D to others	2,561	0.10	0.30	0	1
R&D to R&D	2,561	0.12	0.32	0	1
<i>Management and administration (M&A)</i>					
Other work activity (others)	2,561	0.50	0.50	0	1
Others to M&A	2,561	0.13	0.34	0	1
M&A to others	2,561	0.13	0.34	0	1
M&A to M&A	2,561	0.23	0.42	0	1
<i>Career-related variables</i>					
Hours work per week change	2,561	0.08	10.9	-64	64
Tenure change	2,561	-2.02	3.69	-35	38
Health insurance change	2,561	0.02	.38	-1	1
Pension plan change	2,561	0.03	.56	-1	1
Profit sharing change	2,561	-0.01	.59	-1	1
Paid vacation change	2,561	0.01	.37	-1	1
Supervision change	2,561	0.51	72.6	-1,790	1,917
ln (Salary) change	2,561	0.20	.88	-11.1	10.82
Job satisfaction with contribution to society (2013)	2,561	2.90	0.94	1	4
Job satisfaction with salary (2013)	2,561	3.09	0.88	1	4
Job satisfaction with benefits (2013)	2,561	2.88	0.88	1	4
Job satisfaction with job security (2013)	2,561	2.97	0.91	1	4

Table 15 Robust OLS of Different Dimensions of Job Satisfaction

VARIABLES	Model 1 Job satisfaction change with contribution to society	Model 2 Job satisfaction change with salary	Model 3 Job satisfaction change with benefits	Model 4 Job satisfaction change with job security
Switching to private sector	Base	Base	Base	Base
Switching to nonprofit sector	0.50*** (0.05)	-0.23*** (0.06)	0.08 (0.06)	0.15*** (0.05)
Switching to public sector	0.44*** (0.04)	-0.24*** (0.05)	0.11* (0.06)	0.14*** (0.05)
<i>Educational Characteristics</i>				
Graduate degree change	-0.03 (0.09)	-0.15 (0.09)	-0.21** (0.11)	-0.14* (0.08)
Degree job fit change	0.12*** (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)
<i>Employer characteristics</i>				
Employer size change	-0.00 (0.01)	-0.00 (0.01)	0.02*** (0.01)	0.00 (0.01)
<i>Work activity</i>				
<i>Research and development (R&D)</i>				
Other work activity (others)	Base	Base	Base	Base
Others to R&D	0.04 (0.05)	0.01 (0.06)	0.11* (0.06)	-0.02 (0.06)
R&D to others	-0.12** (0.06)	0.08 (0.05)	0.07 (0.06)	0.01 (0.06)
R&D to R&D	-0.01 (0.05)	0.13*** (0.05)	0.11** (0.05)	-0.03 (0.05)
<i>Management and administration (MA)</i>				
Other work activity (others)	Base	Base	Base	Base
Others to MA	-0.08 (0.06)	0.02 (0.05)	-0.04 (0.06)	-0.05 (0.06)
MA to others	0.05 (0.05)	0.05 (0.05)	0.01 (0.05)	0.02 (0.05)
MA to MA	-0.14*** (0.04)	0.06 (0.04)	0.10** (0.04)	-0.07 (0.04)
<i>Career-related variables</i>				
Hours work per week change	-0.00 (0.00)	-0.00* (0.00)	-0.00** (0.00)	-0.01*** (0.00)
Tenure change	-0.02*** (0.00)	-0.02*** (0.00)	-0.01** (0.00)	-0.01*** (0.00)
Health insurance change	0.04 (0.05)	0.01 (0.05)	0.42*** (0.06)	0.08 (0.05)
Pension plan change	0.02 (0.03)	0.04 (0.03)	0.15*** (0.03)	0.09*** (0.03)
Profit sharing change	0.08*** (0.03)	0.07*** (0.02)	0.11*** (0.03)	0.12*** (0.03)
Paid vacation change	0.01 (0.05)	-0.13** (0.05)	0.11* (0.06)	0.13** (0.06)
Supervision change	0.00 (0.00)	-0.00 (0.00)	-0.00* (0.00)	-0.00 (0.00)
ln (Salary) change	-0.02 (0.02)	0.15*** (0.02)	0.02 (0.02)	0.01 (0.02)
Observations	2,561	2,561	2,561	2,561
R-squared	0.48	0.46	0.49	0.47

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 16 Average Marginal Effect of Sector Switch by Gender

Variables	Model 1 Job satisfaction change with contribution to society		Model 2 Job satisfaction change with salary		Model 3 Job satisfaction change with benefits		Model 4 Job satisfaction change with job security	
	Men Base	Women Base	Men Base	Women Base	Men Base	Women Base	Men Base	Women Base
Switching to private sector	0.45*** (0.09)	0.52*** (0.05)	-0.18* (0.09)	-0.26*** (0.07)	0.15 (0.10)	0.05 (0.07)	0.21** (0.09)	0.12* (0.06)
Switching to nonprofit sector	0.54*** (0.06)	0.37*** (0.06)	- 0.26*** (0.07)	-0.23*** (0.07)	0.07 (0.08)	0.14* (0.07)	0.08 (0.08)	0.19*** (0.06)
Observations	2,561	2,561	2,561	2,561	2,561	2,561	2,561	2,561

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

CHAPTER 5
CONCLUSION

This dissertation work focuses on turnover and career outcomes for STEM personnel in the United States. Previous studies mainly pay attention to the antecedents of individuals' turnover, while individuals' career outcomes after turnover are largely ignored. Turnover is not the end of the decision-making process. For nowadays workforce with boundaryless careers (Arthur, 1994), it is important for us to delve into individuals' career development after turnover and job mobility. I have developed three sets of research questions for turnover and career outcomes. The first essay focuses on: What is the effect of voluntary and involuntary turnover on career outcomes? Among individuals with different voluntary turnover reasons, are there any differences concerning their career outcomes? The research questions of the second essay are: What are the reasons for voluntary turnover for female and male scientists and engineers? After voluntary turnover, is there a gender gap in career outcomes between men and women? The third essay asks the following research question: Do individuals switching from the private sector to the nonprofit or public sector have an increase (or a decline) in job satisfaction compared to those switching jobs within the private sector? I have developed theoretical arguments and empirical tests for the above research questions.

My findings in the first essay show the positive effects of voluntary turnover on job satisfaction and negative effects of involuntary turnover on salary and number supervised. Among individuals with voluntary turnover, those who change for job-related reasons are more likely to have a higher level of job satisfaction. In the second essay, I find that for external voluntary turnover, male scientists and engineers are more likely to change for career-related reasons and female scientists and engineers are more likely to change for amenity and constrain reasons. Furthermore, female scientists and engineers are more likely to have a lower level of increase in job satisfaction for external voluntary

turnover, while females are more likely to have a higher level of increase in job satisfaction and salary compared to males after internal voluntary turnover. In the third essay, results show that compared to those who switch within the private sector, individuals who switch from the private to the nonprofit and public sector are more likely to have an increase in satisfaction with the job's contribution to society and job security, and a decline in satisfaction with the job's salary. Those switching from the private to the public sector also tend to have an increase in satisfaction with job benefits.

The dissertation as a whole contributes to the general literature of turnover and job mobility, by emphasizing the effect of turnover on individuals' subjective and objective career outcomes (like job satisfaction, salary, and number of people supervised). The dissertation also contributes to STEM workforce literature by focusing on their work characteristics, gender gap, and mobility across sectoral boundaries. The United States suffers from STEM workforce shortages, especially in certain fields and sectors (Xue & Larson, 2015; Wright, 2013; Atkinson & Stewart, 2013). Only by first understanding STEM personnel job mobility patterns and career trajectories can we help them to prosper and have better career outcomes.

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APPENDIX A
SUPPLEMENTAL MATERIAL FOR ESSAY 1

Table A3 Voluntary Turnover and Career Outcomes

	Model 1			Model 2		
	Job satisfaction	Salary	Number supervised	Job satisfaction	Salary	Number supervised
Voluntary turnover	0.05*** (0.00)	-0.01** (0.01)	2.60*** (0.81)	0.19*** (0.01)	0.00 (0.01)	-1.66 (1.14)
Demographic characteristics						
Female	0.00 (0.00)	-0.16*** (0.00)	-5.89*** (0.68)	-0.37 (0.29)	-0.16 (0.38)	-1.04 (59.11)
Minority	-0.03*** (0.00)	-0.05*** (0.00)	1.93** (0.78)	-0.09 (0.10)	-0.06 (0.13)	7.87 (20.48)
Age	-0.02*** (0.00)	0.06*** (0.00)	0.97*** (0.22)	-0.00 (0.01)	0.07*** (0.01)	1.44 (2.04)
Squa_age	0.00*** (0.00)	-0.00*** (0.00)	-0.01*** (0.00)	0.00 (0.00)	-0.00*** (0.00)	0.01 (0.01)
Married	0.09*** (0.00)	0.05*** (0.00)	2.80*** (0.77)	-0.02 (0.01)	0.01 (0.01)	-1.20 (2.16)
Place of birth	0.09*** (0.00)	-0.03*** (0.00)	1.23 (0.75)	-	-	-
Children at home	0.02*** (0.00)	0.03*** (0.00)	1.34* (0.74)	-0.00 (0.01)	0.02 (0.01)	2.65 (1.74)
Educational characteristics						
<i>Education degree type</i>						
Bachelor	Base	Base	Base	Base	Base	Base
Master	-0.01*** (0.00)	0.14*** (0.00)	3.40*** (0.70)	-0.02 (0.02)	0.09*** (0.03)	-1.37 (4.02)
Doctorate	-0.00 (0.01)	0.33*** (0.01)	0.89 (1.29)	-0.19*** (0.03)	0.47*** (0.04)	-5.27 (6.51)
Professional	0.00 (0.01)	0.52*** (0.01)	-10.67*** (1.51)	0.02 (0.09)	0.84*** (0.12)	-7.70 (18.72)
Employer characteristics						
<i>Sector</i>						
Educational institutions	Base	Base	Base	Base	Base	Base
Government	0.00 (0.01)	0.33*** (0.01)	6.75*** (1.14)	0.06*** (0.02)	0.24*** (0.03)	12.87*** (4.32)
Private business	-0.04*** (0.00)	0.43*** (0.01)	1.78** (0.88)	0.02 (0.02)	0.20*** (0.02)	3.69 (3.14)
<i>Discipline affiliations</i>						
Computer science and math	Base	Base	Base	Base	Base	Base
Biological, agricultural, and other life sciences	-0.01 (0.01)	-0.28*** (0.01)	2.99* (1.78)	-0.03 (0.02)	0.05* (0.03)	1.80 (4.76)
Physical science	-0.03*** (0.01)	-0.21*** (0.01)	0.68 (1.91)	-0.05* (0.03)	0.02 (0.04)	1.32 (5.44)
Social science	0.02** (0.01)	-0.10*** (0.01)	5.09*** (1.93)	-0.05* (0.03)	-0.04 (0.03)	-2.25 (5.18)
Engineering	-0.03*** (0.01)	-0.03*** (0.01)	-2.69** (1.27)	-0.02 (0.02)	0.02 (0.02)	-3.20 (3.58)
Other S and E related	-0.00 (0.01)	-0.12*** (0.01)	11.33*** (1.21)	-0.02 (0.02)	0.03* (0.02)	3.69 (3.09)
Non S and E related	0.02*** (0.01)	-0.21*** (0.01)	21.78*** (1.11)	-0.01 (0.02)	-0.04** (0.02)	8.65*** (3.12)
Career-related variables						
Hours work per week	-0.00*** (0.00)	0.02*** (0.00)	0.74*** (0.03)	-0.00*** (0.00)	0.01*** (0.00)	0.28*** (0.06)
Job fit	0.15*** (0.00)	0.11*** (0.00)	1.01** (0.49)	0.10*** (0.01)	0.04*** (0.01)	1.37 (1.09)
Work training	0.09*** (0.00)	0.03*** (0.00)	0.01 (0.67)	0.04*** (0.01)	0.03*** (0.01)	2.16** (1.09)
Health insurance	-0.04*** (0.01)	0.42*** (0.01)	-2.11 (1.33)	0.02 (0.01)	0.27*** (0.01)	-3.04 (2.31)
Pension plan	0.04***	0.21***	-0.21	0.04***	0.10***	-0.93

	(0.00)	(0.01)	(0.92)	(0.01)	(0.01)	(1.60)
Profit sharing	0.10***	0.03***	3.15***	0.06***	0.01	1.33
	(0.00)	(0.00)	(0.76)	(0.01)	(0.01)	(1.33)
Paid vacation	-0.06***	0.38***	-1.15	-0.02**	0.34***	5.48**
	(0.01)	(0.01)	(1.25)	(0.01)	(0.01)	(2.23)
Job satisfaction		0.11***	3.52***		0.04***	1.70**
		(0.00)	(0.45)		(0.01)	(0.79)
ln (Salary)	0.07***		5.92***	0.02***		0.83
	(0.00)		(0.36)	(0.00)		(0.61)
Number supervised	0.00***	0.00***		0.00**	0.00	
	(0.00)	(0.00)		(0.00)	(0.00)	
Constant	2.47***	7.16***	-138.80***	2.91***	7.88***	-102.85
	(0.03)	(0.03)	(5.73)	(0.40)	(0.52)	(80.97)
Observations	192,672	192,672	192,672	109,839	109,839	109,839
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4 Involuntary Turnover and Career Outcomes

	Job satisfaction	Model 1		Job satisfaction	Model 2	
		Salary	Number supervised		Salary	Number supervised
Involuntary turnover	-0.21*** (0.01)	-0.01 (0.01)	-1.37 (1.69)	-0.00 (0.01)	-0.05*** (0.02)	-3.77* (2.19)
<i>Demographic characteristics</i>						
Female	0.01* (0.00)	-0.16*** (0.00)	-5.77*** (0.76)	-1.03** (0.48)	-0.15 (0.66)	1.09 (85.38)
Minority	-0.03*** (0.00)	-0.05*** (0.01)	2.01** (0.87)	-0.12 (0.13)	-0.05 (0.18)	7.13 (23.84)
Age	-0.02*** (0.00)	0.06*** (0.00)	0.75*** (0.24)	-0.04*** (0.01)	0.08*** (0.02)	2.01 (1.94)
Squa_age	0.00*** (0.00)	-0.00*** (0.00)	-0.01** (0.00)	0.00*** (0.00)	-0.00*** (0.00)	-0.01 (0.01)
Married	0.10*** (0.00)	0.05*** (0.01)	3.08*** (0.86)	-0.00 (0.01)	0.02 (0.02)	-1.18 (2.34)
Place of birth	0.09*** (0.00)	-0.03*** (0.01)	0.46 (0.83)	- -	- -	- -
Children at home	0.02*** (0.00)	0.03*** (0.01)	0.97 (0.81)	0.00 (0.01)	0.02* (0.01)	1.55 (1.69)
<i>Educational characteristics</i>						
<i>Education degree type</i>						
Bachelor	Base	Base	Base	Base	Base	Base
Master	-0.02*** (0.00)	0.14*** (0.00)	3.21*** (0.78)	-0.04 (0.03)	0.07** (0.04)	0.39 (4.83)
Doctorate	-0.02** (0.01)	0.35*** (0.01)	0.08 (1.44)	-0.05 (0.05)	0.42*** (0.07)	-0.69 (9.33)
Professional	-0.01 (0.01)	0.54*** (0.01)	-12.01*** (1.64)	-0.11 (0.14)	1.29*** (0.19)	-2.20 (24.94)
<i>Employer characteristics</i>						
<i>Sector</i>						
Educational institutions	Base	Base	Base	Base	Base	Base
Government	-0.00 (0.01)	0.34*** (0.01)	5.89*** (1.26)	0.04 (0.03)	0.17*** (0.04)	0.44 (5.43)
Private business	-0.03*** (0.00)	0.42*** (0.01)	2.35** (0.97)	0.07*** (0.02)	0.08** (0.03)	-0.39 (4.19)
<i>Discipline affiliations</i>						
Computer science and math	Base	Base	Base	Base	Base	Base
Biological, agricultural, and other life sciences	0.01 (0.01)	-0.27*** (0.01)	3.18 (1.95)	0.04 (0.03)	0.04 (0.04)	3.72 (4.83)
Physical science	-0.02** (0.01)	-0.21*** (0.01)	0.48 (2.08)	0.01 (0.03)	0.03 (0.04)	1.95 (5.70)
Social science	0.03*** (0.01)	-0.08*** (0.01)	5.12** (2.16)	0.03 (0.03)	-0.05 (0.04)	0.72 (5.70)
Engineering	-0.03*** (0.01)	-0.03*** (0.01)	-3.16** (1.40)	0.00 (0.02)	0.02 (0.03)	-4.03 (3.70)
Other S and E related	0.01 (0.01)	-0.11*** (0.01)	11.20*** (1.34)	0.00 (0.02)	0.03 (0.02)	4.42 (3.20)
Non S and E related	0.03*** (0.01)	-0.20*** (0.01)	21.60*** (1.23)	0.01 (0.02)	-0.03 (0.03)	7.36** (3.30)
<i>Career-related variables</i>						
Hours work per week	-0.00*** (0.00)	0.02*** (0.00)	0.74*** (0.03)	-0.00*** (0.00)	0.01*** (0.00)	0.25*** (0.06)
Job fit	0.15*** (0.00)	0.11*** (0.00)	1.25** (0.54)	0.07*** (0.01)	0.02** (0.01)	1.69 (1.12)
Work training	0.09*** (0.00)	0.02*** (0.00)	0.19 (0.74)	0.03*** (0.01)	0.03*** (0.01)	1.36 (1.09)
Health insurance	-0.04*** (0.01)	0.39*** (0.01)	-2.39 (1.46)	0.03* (0.01)	0.22*** (0.02)	-2.20 (2.35)
Pension plan	0.04*** (0.01)	0.22*** (0.01)	-0.26 (1.03)	0.05*** (0.01)	0.07*** (0.01)	-0.86 (1.65)
Profit sharing	0.10***	0.04***	3.66***	0.06***	-0.00	-0.09

	(0.00)	(0.01)	(0.84)	(0.01)	(0.01)	(1.34)
Paid vacation	-0.07***	0.36***	-0.41	-0.01	0.25***	5.30**
	(0.01)	(0.01)	(1.37)	(0.01)	(0.02)	(2.27)
Job satisfaction		0.12***	3.42***		0.05***	0.48
		(0.00)	(0.50)		(0.01)	(0.82)
ln (Salary)	0.07***		5.92***	0.03***		0.44
	(0.00)		(0.39)	(0.00)		(0.59)
Number supervised	0.00***	0.00***		0.00	0.00	
	(0.00)	(0.00)		(0.00)	(0.00)	
Constant	2.40***	7.15***	-133.88***	4.15***	7.80***	-91.66
	(0.03)	(0.04)	(6.33)	(0.47)	(0.65)	(83.52)
Observations	160,463	160,463	160,463	74,848	74,848	74,848
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table A5 Voluntary Turnover Reasons and Career Outcomes

	Model 1			Model 2		
	Job satisfaction	Salary	Number supervised	Job satisfaction	Salary	Number supervised
Reasons of voluntary turnover						
Pay, promotion opportunities	0.10*** (0.01)	0.14*** (0.01)	5.33*** (1.48)	0.09*** (0.02)	0.12*** (0.03)	2.39 (4.02)
Working conditions	0.03*** (0.01)	-0.02*** (0.01)	-8.38*** (1.32)	0.21*** (0.02)	-0.02 (0.03)	-5.02 (3.56)
Job location	0.00 (0.01)	0.01 (0.01)	-0.72 (1.43)	0.04* (0.02)	0.02 (0.03)	-3.52 (3.67)
Change in career or professional interests	0.07*** (0.01)	-0.07*** (0.01)	-3.78*** (1.31)	0.09*** (0.02)	-0.05** (0.02)	-6.72* (3.46)
Family-related reasons	-0.04*** (0.01)	-0.07*** (0.01)	-1.39 (1.88)	-0.08*** (0.03)	-0.06* (0.03)	-7.25 (4.95)
School-related reasons	0.02* (0.01)	-0.16*** (0.01)	0.04 (1.98)	0.06* (0.03)	-0.10*** (0.04)	-3.08 (5.42)
Demographic characteristics						
Female	-0.00 (0.01)	-0.11*** (0.01)	-5.94*** (1.37)	0.10 (0.63)	-0.09 (0.75)	-9.36 (107.19)
Minority	-0.03*** (0.01)	-0.04*** (0.01)	2.12 (1.51)	-0.11 (0.30)	0.01 (0.36)	11.65 (50.53)
Age	-0.01*** (0.00)	0.07*** (0.00)	0.73 (0.56)	0.02 (0.05)	0.06 (0.06)	-1.07 (8.66)
Squa_age	0.00*** (0.00)	-0.00*** (0.00)	-0.00 (0.01)	-0.00 (0.00)	-0.00*** (0.00)	0.03 (0.06)
Married	0.09*** (0.01)	0.05*** (0.01)	1.40 (1.54)	-0.08** (0.04)	-0.04 (0.05)	5.04 (6.60)
Place of birth	0.09*** (0.01)	-0.05*** (0.01)	3.40** (1.57)	-	-	-
Children at home	0.04*** (0.01)	0.01 (0.01)	2.41 (1.59)	0.04 (0.04)	0.02 (0.05)	8.59 (6.84)
Educational characteristics						
<i>Education degree type</i>						
Bachelor	Base	Base	Base	Base	Base	Base
Master	-0.01* (0.01)	0.13*** (0.01)	3.65** (1.42)	-0.09 (0.06)	0.15** (0.07)	-3.01 (10.28)
Doctorate	0.03** (0.02)	0.28*** (0.02)	3.00 (2.69)	-0.21* (0.11)	0.35*** (0.14)	-6.24 (19.32)
Professional	0.05*** (0.02)	0.43*** (0.02)	-2.05 (3.46)	-0.03 (0.22)	0.43* (0.26)	-4.41 (36.84)
Employer characteristics						
<i>Sector</i>						
Educational institutions	Base	Base	Base	Base	Base	Base
Government	0.03** (0.01)	0.28*** (0.02)	9.18*** (2.46)	0.02 (0.06)	0.22*** (0.07)	-2.99 (10.08)
Private business	-0.06*** (0.01)	0.39*** (0.01)	-0.90 (1.87)	-0.02 (0.04)	0.22*** (0.05)	0.05 (7.15)
<i>Discipline affiliations</i>						
Computer science and math	Base	Base	Base	Base	Base	Base
Biological, agricultural, and other life sciences	-0.05** (0.02)	-0.29*** (0.03)	1.68 (3.80)	-0.03 (0.10)	0.10 (0.11)	2.08 (16.28)
Physical science	-0.05** (0.02)	-0.19*** (0.03)	0.88 (4.15)	-0.10 (0.11)	-0.03 (0.13)	4.34 (19.06)
Social science	-0.03 (0.02)	-0.18*** (0.03)	4.09 (3.85)	-0.05 (0.08)	-0.14 (0.10)	8.16 (14.05)
Engineering	-0.04** (0.01)	-0.01 (0.02)	-1.10 (2.59)	-0.04 (0.07)	0.02 (0.08)	-5.53 (11.28)
Other S and E related	-0.05*** (0.01)	-0.12*** (0.02)	11.08*** (2.46)	0.00 (0.06)	0.02 (0.07)	-3.08 (9.35)
Non S and E related	-0.06*** (0.01)	-0.26*** (0.02)	21.30*** (2.19)	-0.03 (0.05)	-0.12* (0.06)	17.82** (8.90)
Career-related variables						

Individuals	34,834	34,834	34,834	34,834	34,834	34,834
Individuals	34,834	34,834	34,834	34,834	34,834	34,834
Hours work per week	-0.00**	0.02***	0.63***	-0.00	0.01***	0.22
	(0.00)	(0.00)	(0.06)	(0.00)	(0.00)	(0.20)
Job fit	0.17***	0.11***	-0.39	0.19***	0.09***	2.72
	(0.01)	(0.01)	(0.98)	(0.02)	(0.02)	(3.40)
Work training	0.07***	0.02**	-0.47	0.06***	0.01	1.34
	(0.01)	(0.01)	(1.37)	(0.02)	(0.03)	(3.87)
Health insurance	-0.02	0.52***	-1.18	0.01	0.41***	-0.74
	(0.02)	(0.02)	(2.69)	(0.04)	(0.05)	(7.34)
Pension plan	0.06***	0.15***	0.42	0.03	0.14***	-1.28
	(0.01)	(0.01)	(1.79)	(0.03)	(0.03)	(4.86)
Profit sharing	0.10***	0.02	1.22	0.09***	0.05*	1.11
	(0.01)	(0.01)	(1.53)	(0.03)	(0.03)	(4.51)
Paid vacation	-0.05***	0.42***	-4.26	-0.10**	0.46***	-0.71
	(0.01)	(0.02)	(2.60)	(0.04)	(0.05)	(7.25)
Job satisfaction		0.06***	4.03***		0.01	0.85
		(0.01)	(0.90)		(0.02)	(2.49)
ln (Salary)	0.04***		5.28***	0.01		0.39
	(0.00)		(0.73)	(0.01)		(2.09)
Number supervised	0.00***	0.00***		0.00	0.00	
	(0.00)	(0.00)		(0.00)	(0.00)	
Constant	2.48***	7.21***	-117.88***	2.18	8.49***	-18.06
	(0.07)	(0.08)	(13.04)	(1.60)	(1.90)	(270.57)
Observations	39,484	39,484	39,484	39,484	39,484	39,484
Mean VIF	7.32	7.26	7.33	7.32	7.26	7.33
Individual FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX B
SUPPLEMENTAL MATERIAL FOR ESSAY 2

Table B9 Robust OLS for EVT and Job Satisfaction

Variables	Model 1 Job satisfaction 2015	Model 2 Job satisfaction 2015	Model 3 Job satisfaction 2015	Model 4 Job satisfaction 2015
External voluntary turnover (EVT)	0.19*** (0.01)	0.21*** (0.01)	0.22*** (0.03)	0.22*** (0.02)
EVT × Female		-0.04* (0.02)	-0.04 (0.04)	-0.04 (0.03)
Female × Married			0.04*** (0.02)	
EVT × Married			-0.01 (0.03)	
EVT × Female × Married			0.01 (0.04)	
Female × Graduate degree				-0.02 (0.01)
EVT × Graduate degree				-0.01 (0.03)
EVT × Female × Graduate degree				0.01 (0.04)
Demographic characteristics				
Female	-0.00 (0.01)	0.01 (0.01)	-0.02* (0.01)	0.02* (0.01)
Minority	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Age	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Squa_age	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
Married	0.06*** (0.01)	0.06*** (0.01)	0.04*** (0.01)	0.06*** (0.01)
Place of birth	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Children at home	0.01* (0.01)	0.01* (0.01)	0.01** (0.01)	0.01* (0.01)
Educational characteristics				
Graduate degree	-0.02*** (0.01)	-0.02*** (0.01)	-0.02*** (0.01)	-0.01 (0.01)
Degree job fit	0.08*** (0.01)	0.08*** (0.01)	0.08*** (0.01)	0.08*** (0.01)
Employer characteristics				
Employer size	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Sector				
Educational institutions	Base	Base	Base	Base
Government	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)
Private business	-0.02 (0.01)	-0.02 (0.01)	-0.02 (0.01)	-0.02 (0.01)
Work activity				
Research and Development	Base	Base	Base	Base
Teaching	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Management and Administration	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)
Computer Applications	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Other	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)
Discipline affiliations				
Computer science and math	Base	Base	Base	Base

Biological, agricultural, and other life sciences	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Physical science	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Social science	-0.01 (0.02)	-0.01 (0.02)	-0.00 (0.02)	-0.00 (0.02)
Engineering	-0.02* (0.01)	-0.02* (0.01)	-0.02 (0.01)	-0.02 (0.01)
Other S and E related	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Non S and E related	0.02 (0.01)	0.02* (0.01)	0.02* (0.01)	0.02 (0.01)
<i>Career-related variables</i>				
Hours work per week	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
Tenure (years)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
Work training	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Health insurance	-0.03** (0.01)	-0.03** (0.01)	-0.03** (0.01)	-0.03** (0.01)
Pension plan	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Profit sharing	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)
Paid vacation	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Supervision	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
ln (Salary)	0.04*** (0.00)	0.04*** (0.00)	0.05*** (0.00)	0.05*** (0.00)
Job satisfaction (2013)	0.44*** (0.01)	0.44*** (0.01)	0.44*** (0.01)	0.44*** (0.01)
Constant	1.33*** (0.07)	1.32*** (0.07)	1.34*** (0.07)	1.31*** (0.07)
Observations	41,016	41,016	41,016	41,016
R-squared	0.25	0.25	0.25	0.25

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B10 Robust OLS for EVT and Salary

Variables	Model 1 lnsalary2015	Model 2 lnsalary2015	Model 3 lnsalary2015	Model 4 lnsalary2015
External voluntary turnover (EVT)	0.06*** (0.01)	0.07*** (0.02)	0.09** (0.04)	0.11*** (0.02)
EVT × Female		-0.01 (0.03)	-0.02 (0.04)	-0.06 (0.04)
Female × Married			-0.05*** (0.02)	
EVT × Married			-0.03 (0.04)	
EVT × Female × Married			0.01 (0.06)	
Female × Graduate degree				0.03* (0.02)
EVT × Graduate degree				-0.08** (0.04)
EVT × Female × Graduate degree				0.08 (0.05)
<i>Demographic characteristics</i>				
Female	-0.11*** (0.01)	-0.10*** (0.01)	-0.07*** (0.02)	-0.12*** (0.01)
Minority	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)
Age	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)
Squa_age	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
Married	0.03*** (0.01)	0.03*** (0.01)	0.06*** (0.01)	0.03*** (0.01)
Place of birth	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Children at home	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.01 (0.01)
<i>Educational characteristics</i>				
Graduate degree	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.12*** (0.01)
Degree job fit	0.08*** (0.01)	0.08*** (0.01)	0.08*** (0.01)	0.08*** (0.01)
<i>Employer characteristics</i>				
Employer size	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)
<i>Sector</i>				
Educational institutions	Base	Base	Base	Base
Government	0.14*** (0.01)	0.14*** (0.01)	0.14*** (0.01)	0.14*** (0.01)
Private business	0.25*** (0.01)	0.26*** (0.01)	0.25*** (0.01)	0.26*** (0.01)
<i>Work activity</i>				
Research and Development	Base	Base	Base	Base
Teaching	-0.05*** (0.02)	-0.05*** (0.02)	-0.05*** (0.02)	-0.05*** (0.02)
Management and Administration	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Computer Applications	0.06*** (0.02)	0.06*** (0.02)	0.06*** (0.02)	0.06*** (0.02)
Other	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
<i>Discipline affiliations</i>				
Computer science and math	Base	Base	Base	Base
Biological, agricultural, and other life sciences	-0.13***	-0.13***	-0.13***	-0.12***

	(0.02)	(0.02)	(0.02)	(0.02)
Physical science	-0.11***	-0.11***	-0.11***	-0.10***
	(0.02)	(0.02)	(0.02)	(0.02)
Social science	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Engineering	-0.03*	-0.03*	-0.03*	-0.03*
	(0.02)	(0.02)	(0.02)	(0.02)
Other S and E related	-0.05***	-0.05***	-0.05***	-0.04***
	(0.02)	(0.02)	(0.02)	(0.02)
Non S and E related	-0.10***	-0.10***	-0.10***	-0.10***
	(0.02)	(0.02)	(0.02)	(0.02)
<i>Career-related variables</i>				
Hours work per week	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Tenure (years)	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Work training	0.03***	0.03***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
Health insurance	0.28***	0.28***	0.28***	0.28***
	(0.02)	(0.02)	(0.02)	(0.02)
Pension plan	0.10***	0.10***	0.10***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Profit sharing	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Paid vacation	0.24***	0.24***	0.24***	0.24***
	(0.02)	(0.02)	(0.02)	(0.02)
Supervision	0.09***	0.09***	0.09***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)
Job satisfaction	0.08***	0.08***	0.08***	0.08***
	(0.01)	(0.01)	(0.01)	(0.01)
ln (Salary) (2013)	0.36***	0.36***	0.36***	0.36***
	(0.02)	(0.02)	(0.02)	(0.02)
Constant	4.61***	4.61***	4.59***	4.62***
	(0.16)	(0.16)	(0.16)	(0.16)
Observations	41,016	41,016	41,016	41,016
R-squared	0.41	0.41	0.41	0.41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B11 Robust OLS for IVT and Job Satisfaction

Variables	Model 1 Job satisfaction 2015	Model 2 Job satisfaction 2015	Model 3 Job satisfaction 2015	Model 4 Job satisfaction 2015
Internal voluntary turnover (IVT)	0.12*** (0.01)	0.10*** (0.02)	0.13*** (0.03)	0.11*** (0.02)
IVT × Female		0.04* (0.02)	0.03 (0.05)	0.05 (0.04)
Female × Married			0.04*** (0.01)	
IVT × Married			-0.04 (0.04)	
IVT × Female × Married			0.02 (0.05)	
Female × Graduate degree				-0.02 (0.01)
IVT × Graduate degree				-0.01 (0.03)
IVT × Female × Graduate degree				-0.01 (0.05)
Demographic characteristics				
Female	0.01 (0.01)	0.00 (0.01)	-0.03** (0.01)	0.01 (0.01)
Minority	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Age	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Squa_age	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
Married	0.06*** (0.01)	0.06*** (0.01)	0.04*** (0.01)	0.06*** (0.01)
Place of birth	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
Children at home	0.02** (0.01)	0.02** (0.01)	0.02** (0.01)	0.02** (0.01)
Educational characteristics				
Graduate degree	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.02* (0.01)
Degree job fit	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)	0.07*** (0.01)
Employer characteristics				
Employer size	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)
Sector				
Educational institutions	Base	Base	Base	Base
Government	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Private business	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)
Work activity				
Research and Development	Base	Base	Base	Base
Teaching	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Management and Administration	-0.02** (0.01)	-0.02** (0.01)	-0.02** (0.01)	-0.02** (0.01)
Computer Applications	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)
Other	-0.02** (0.01)	-0.02** (0.01)	-0.02** (0.01)	-0.02** (0.01)
Discipline affiliations				
Computer science and math	Base	Base	Base	Base

Biological, agricultural, and other life sciences	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Physical science	0.00 (0.02)	0.00 (0.02)	0.01 (0.02)	0.00 (0.02)
Social science	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Engineering	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Other S and E related	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Non S and E related	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)
<i>Career-related variables</i>				
Hours work per week	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
Tenure (years)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
Work training	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Health insurance	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Pension plan	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
Profit sharing	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
Paid vacation	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Supervision	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
ln (Salary)	0.05*** (0.00)	0.05*** (0.00)	0.05*** (0.00)	0.05*** (0.00)
Job satisfaction (2013)	0.49*** (0.01)	0.49*** (0.01)	0.49*** (0.01)	0.49*** (0.01)
Constant	1.11*** (0.07)	1.11*** (0.07)	1.12*** (0.07)	1.11*** (0.07)
Observations	38,007	38,007	38,007	38,007
R-squared	0.28	0.28	0.28	0.28

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B12 Robust OLS for IVT and Salary

Variables	Model 1 lnsalary2015	Model 2 lnsalary2015	Model 3 lnsalary2015	Model 4 lnsalary2015
Internal voluntary turnover (IVT)	0.05*** (0.01)	-0.00 (0.02)	-0.02 (0.04)	-0.01 (0.03)
IVT × Female		0.10*** (0.02)	0.09* (0.05)	0.13*** (0.04)
Female × Married			-0.05*** (0.02)	
IVT × Married			0.02 (0.05)	
IVT × Female × Married			0.02 (0.05)	
Female × Graduate degree				0.03** (0.02)
IVT × Graduate degree				0.01 (0.04)
IVT × Female × Graduate degree				-0.05 (0.05)
<i>Demographic characteristics</i>				
Female	-0.09*** (0.01)	-0.10*** (0.01)	-0.07*** (0.02)	-0.12*** (0.01)
Minority	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Age	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)	0.03*** (0.00)
Squa_age	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
Married	0.03*** (0.01)	0.03*** (0.01)	0.05*** (0.01)	0.03*** (0.01)
Place of birth	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Children at home	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
<i>Educational characteristics</i>				
Graduate degree	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.12*** (0.01)
Degree job fit	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
<i>Employer characteristics</i>				
Employer size	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)
<i>Sector</i>				
Educational institutions	Base	Base	Base	Base
Government	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)	0.13*** (0.01)
Private business	0.23*** (0.01)	0.23*** (0.01)	0.23*** (0.01)	0.23*** (0.01)
<i>Work activity</i>				
Research and Development	Base	Base	Base	Base
Teaching	-0.06*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)
Management and Administration	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Computer Applications	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)	0.05** (0.02)
Other	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)	0.02* (0.01)
<i>Discipline affiliations</i>				
Computer science and math	Base	Base	Base	Base
Biological, agricultural, and other life sciences	-0.11***	-0.11***	-0.11***	-0.11***

	(0.02)	(0.02)	(0.02)	(0.02)
Physical science	-0.10***	-0.10***	-0.10***	-0.10***
	(0.02)	(0.02)	(0.02)	(0.02)
Social science	0.02	0.02	0.02	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Engineering	-0.02	-0.02	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Other S and E related	-0.03*	-0.03*	-0.03*	-0.03*
	(0.02)	(0.02)	(0.02)	(0.02)
Non S and E related	-0.07***	-0.07***	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)
<i>Career-related variables</i>				
Hours work per week	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Tenure (years)	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Work training	0.02**	0.02**	0.02**	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Health insurance	0.24***	0.24***	0.24***	0.24***
	(0.02)	(0.02)	(0.02)	(0.02)
Pension plan	0.10***	0.10***	0.10***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)
Profit sharing	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Paid vacation	0.19***	0.19***	0.19***	0.19***
	(0.02)	(0.02)	(0.02)	(0.02)
Supervision	0.09***	0.09***	0.09***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)
Job satisfaction	0.09***	0.09***	0.09***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)
ln (Salary) (2013)	0.39***	0.39***	0.39***	0.39***
	(0.02)	(0.02)	(0.02)	(0.02)
Constant	4.41***	4.41***	4.40***	4.42***
	(0.17)	(0.17)	(0.17)	(0.17)
Observations	38,007	38,007	38,007	38,007
R-squared	0.44	0.44	0.44	0.44

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX C
SUPPLEMENTAL MATERIAL FOR ESSAY 3

Table C15 Robust OLS of Different Dimensions of Job Satisfaction

VARIABLES	Model 1 Job satisfaction change with contribution to society	Model 2 Job satisfaction change with salary	Model 3 Job satisfaction change with benefits	Model 4 Job satisfaction change with job security
Switching to private sector	Base	Base	Base	Base
Switching to nonprofit sector	0.50*** (0.05)	-0.23*** (0.06)	0.08 (0.06)	0.15*** (0.05)
Switching to public sector	0.44*** (0.04)	-0.24*** (0.05)	0.11* (0.06)	0.14*** (0.05)
Demographic Characteristics				
Women (2013)	0.09*** (0.03)	-0.07** (0.03)	-0.06* (0.03)	-0.01 (0.03)
Minority (2013)	0.05 (0.04)	-0.02 (0.04)	-0.01 (0.04)	0.05 (0.04)
Age (2013)	-0.02 (0.02)	0.03** (0.02)	0.03 (0.02)	-0.00 (0.02)
Squa_age (2013)	0.00 (0.00)	-0.00** (0.00)	-0.00* (0.00)	-0.00 (0.00)
Married (2013)	0.03 (0.04)	0.07** (0.03)	0.01 (0.04)	0.10*** (0.04)
Place of birth (2013)	-0.03 (0.04)	0.05 (0.03)	-0.01 (0.04)	0.07* (0.04)
Children at home (2013)	0.09** (0.04)	0.04 (0.04)	0.00 (0.04)	-0.06 (0.04)
Educational Characteristics				
Graduate degree change	-0.03 (0.09)	-0.15 (0.09)	-0.21** (0.11)	-0.14* (0.08)
Degree job fit change	0.12*** (0.03)	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)
Employer characteristics				
Employer size change	-0.00 (0.01)	-0.00 (0.01)	0.02*** (0.01)	0.00 (0.01)
Work activity				
<i>Research and development (R&D)</i>				
Other work activity (others)	Base	Base	Base	Base
Others to R&D	0.04 (0.05)	0.01 (0.06)	0.11* (0.06)	-0.02 (0.06)
R&D to others	-0.12** (0.06)	0.08 (0.05)	0.07 (0.06)	0.01 (0.06)
R&D to R&D	-0.01 (0.05)	0.13*** (0.05)	0.11** (0.05)	-0.03 (0.05)
<i>Management and administration (MA)</i>				
Other work activity (others)	Base	Base	Base	Base
Others to MA	-0.08 (0.06)	0.02 (0.05)	-0.04 (0.06)	-0.05 (0.06)
MA to others	0.05 (0.05)	0.05 (0.05)	0.01 (0.05)	0.02 (0.05)
MA to MA	-0.14*** (0.04)	0.06 (0.04)	0.10** (0.04)	-0.07 (0.04)
Career-related variables				
Hours work per week change	-0.00 (0.00)	-0.00* (0.00)	-0.00** (0.00)	-0.01*** (0.00)
Tenure change	-0.02*** (0.00)	-0.02*** (0.00)	-0.01** (0.00)	-0.01*** (0.00)
Health insurance change	0.04 (0.05)	0.01 (0.05)	0.42*** (0.06)	0.08 (0.05)
Pension plan change	0.02 (0.03)	0.04 (0.03)	0.15*** (0.03)	0.09*** (0.03)
Profit sharing change	0.08***	0.07***	0.11***	0.12***

	(0.03)	(0.02)	(0.03)	(0.03)
Paid vacation change	0.01	-0.13**	0.11*	0.13**
	(0.05)	(0.05)	(0.06)	(0.06)
Supervision change	0.00	-0.00	-0.00*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
ln (Salary) change	-0.02	0.15***	0.02	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Job satisfaction with contribution to society (2013)	-0.72***			
	(0.02)			
Job satisfaction with salary (2013)		-0.73***		
		(0.02)		
Job satisfaction with benefits (2013)			-0.73***	
			(0.02)	
Job satisfaction with job security (2013)				-0.79***
				(0.02)
Constant	2.54***	1.64***	1.87***	2.61***
	(0.31)	(0.30)	(0.32)	(0.33)
Observations	2,561	2,561	2,561	2,561
R-squared	0.48	0.46	0.49	0.47

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1