Gendered Expectations: How Informal Networks Shape Psychosocial Outcomes for STEM Faculty in Gendered Institutions

by

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ABSTRACT

Theories related to social identity provide insight on how gender may be meaningful in organizations. This dissertation examines how psychosocial outcomes for science, technology, engineering, and mathematics (STEM) faculty are influenced by the proportion of women in productivity, support, and advice networks in gendered academic institutions. Psychosocial outcomes are defined as the psychological and social perspectives of the organizational environment. Gendered aspects in organizations are of theoretical importance because they provide opportunities to investigate how STEM faculty attain psychosocial outcomes. An underlying argument in gender literature is that women, compared to men, are more likely to provide emotional support. As women's presence in STEM departments increases, STEM faculty are likely to rely on women to provide emotional support which may influence psychosocial outcomes of the work environment.

Universities are considered to be gendered organizational environments, where masculine and feminine characteristics are evident within their processes, practices, images, and through distribution of power. Universities are broadly categorized as two types: research focused and teaching focused universities. Both university types are deeply involved with the education of students but promotional standards for faculty members and the primary focus of these universities is dictated by the categorization of research versus teaching. University structuring is gendered, making them an ideal setting to investigate questions related to identity and psychosocial outcomes. Drawing from gendered theory, social identity theory, social network theory, and social capital theory, I ask the following research question: Does the proportion of women in informal networks influence psychosocial outcomes within gendered university settings?

To examine how psychosocial outcomes are influenced by informal networks, I use survey data from a 2011 National Science Foundation funded national survey of STEM faculty across universities in the United States (U.S.). I find that psychosocial outcomes vary by university type, faculty gender, and a high proportion of women in three types of academic informal networks. I conclude with a discussion about what the results mean for practice and future research.

DEDICATION

I would like to thank my advisor and mentor, Dr. Mary K. Feeney, for her encouragement and endless support. I have grown as a researcher and most importantly as a person because of her. This accomplishment and my achievements thus far have been thanks to her belief in my abilities, her mentorship, and her commitment towards her students.

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This dissertation is dedicated to my grandparents: Leonor Garcia Jiménez, Frank Jiménez, Julia Camarena, and Miguel Camarena. Without their hard work, dedication to our family, and their many sacrifices this journey would not have been possible. While they may not have had the opportunity to pursue an education past 6th grade, education was always a hope and dream for the family. My most cherished memories involve their attendance to all my school activities and for always encouraging me with schoolwork.

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INTRODUCTION

> The way I think of emotional labor goes as follows: there are certain jobs where it's a requirement, where there is no training provided, and where there's a positive bias towards certain people – women – doing it. It's also the kind of work that is denigrated by society at large. ~ Jennifer Lena (Hackman, 2015)

Women have long been dismissed in organizations due to social and emotional reasonings. Research on gender differences across fields from management, organizational performance, and higher education have something in common: gendered stereotypes attributed to women. Women are characterized with the following words: communal (Wang & Degol, 2013), nurturing (Martin, 1999), and supportive (Bellas & Toutkouhian, 1999). Research on gender differences has been a central focus across disciplines and primarily focuses on how the emotional and sentimental aspects of human behavior associated to women influences organizational outcomes (Mayo, 1933). Organizations, individuals, and relationships can be influenced by gendered perspectives. While research on gender has increased awareness of gender disparities in organizational settings it warrants further focus as to how gendered attributes and women's emotional characteristics influence human behavior in organizations.

One of the first organizational behavior theories, the human relations model, highlights the emotional and sentimental aspects of human behavior in organizations (Kanter, 1977; Mayo, 1933). The human relations model places an emphasis in understanding how participation and communication patterns influence organizational outcomes (Mayo, 1933). One of the first scholars to emphasize masculine and feminine qualities of organizational structuring and workforce responsibilities was Mary Parker Follett (1941). Follett's experience working in a social welfare organization emphasized how women used their emotional talents to communicate and increase participation for organizational outcomes. This study recognizes that organizations are inherently gendered; from organizational structure to employee dynamics (Acker, 1990). This research explores how emotional labor and support can influence psychosocial outcomes for individuals within gendered work environments. In specific, this research focuses on a male-dominated area of focus: faculty in science, technology, engineering and mathematics (STEM) departments in universities in the United States.

I ask the following question: *Does the proportion of women in informal networks influence psychosocial outcomes within gendered university settings?*

Universities

Historically, higher education developed from a rationalistic perspective where formal organization was at all levels. The design of these rational organizations was geared towards suppressing personality and emotions (Kanter, 1977, Weber, 2009). The dehumanization characteristics associated with rational organization designs ultimately developed a masculine culture and ethic (Brockner, 1988; Kanter, 1977), where personal and emotional considerations were set aside in the organization. However, in the post-World War II era, universities began to be classified with research or teaching focuses (Bird, 2011). While masculine ethic and structuring was still largely engrained within this university settings, "feminine" aspects began to be introduced to these university settings.

These research and teaching focuses would later evolve into the Carnegie Classification system that is used today.

The Carnegie Classification system is a listing of designated colleges and universities that primarily categorize two main institution designations as research or teaching. Universities, like most work organizations, are guided by organization ideals, are characterized by hierarchical division of labor, and divide faculty according to the tasks that they perform (Bird, 2011; Eveline, 2004). Academic institutions were originally only comprised of male faculty and students during the 20th century. As women began to enter universities, universities began to correspond with gendered segregation of educational institutions. Research on work organizations categorize the organizational structure, cultures, and practices as gendered (Acker, 1990; 1992; Bird, 2011). Gendered organizations engender masculine or feminine ideals where gendered cultures and stereotypes of men and women become integrated into the organization. On average, the arrangement of work, principles of management, job evaluation, values of tasks, and advancement opportunities are believed to advantage men more than women (Acker, 1992). University institutions are consistently described as highly gendered organizations (Bird, 2011; Currie et al., 2000; Curtis, 2011). These gendered organizational environments lead to the human aspect of organizations.

Gender in the Academy

The majority of students graduating from universities around the United States are women. In 2016, women earned 57% of all bachelor’s degrees, 59% of all master’s degrees, and 53% of all doctorate degrees conferred (PNPI, 2019). The advancements experienced by women students do not extend to the representation of women faculty in these universities. Even after four decades to integrate women in academia, only 42 percent of all full-time faculty are women (Curtis, 2011). Research on women in the academy identifies the largest gender differences are salary, publishing productivity, and promotion outcomes between men and women faculty (Acker & Armenti, 2004; Anders, 2004; Cole & Zuckerman, 1987; Gardiner et al., 2007). Academic institutions are characterized as environments with ‘chilly climates’ for women faculty (Gardiner et al., 2007; Maranto & Griffin, 2011; Wylie, 1995). The ‘chilly climates’ experienced by women faculty are a product of organizational structure and practice. Academic institutions have made an effort to increase the number of academic women in their institutions, either through national or university-based policies or initiatives (NSF, 2013; MIT, 1999). The greatest difficulty for academic women in STEM is the strong effect that culturally defined gender roles have in STEM fields.

Female faculty in STEM disciplines are the most underrepresented in the academy. STEM disciplines have traditionally had a low presence of women (Nielsen, Marschke, Sheff, & Rankin, 2005). Today, female STEM faculty constitute only 37% of all academically employed doctorate holders in the United States (NSF, 2018). A common explanation for the lack of female STEM faculty is gender bias, or the prejudice against women in their capabilities in STEM, which lead people to believe women’s performance is inferior to men (Hand et al., 2017; Riegle-Crumb & Humpries, 2012). Another explanation for the lack of female STEM faculty are the high turnover rates due to the department and university climate (Xu, 2008). These stereotypes shape behavior that lead educator, colleagues, and administrators, to discriminate against women in STEM disciplines (Rice & Barth, 2016). Women in STEM that do attain faculty positions, both tenured and non-tenure track are some of the few that have made it past the "leaky pipeline" in STEM. This pipeline model is often used in reference to women in STEM at various stages: from early to higher education to the STEM workforce. Overall the pipeline model suggests "leakage" problems, where women fall out of STEM degrees, women experience gender disparity at the hiring stage, and/or women leave academia in the midst of their career (Xu, 2008). One way female STEM faculty can avoid issues of turnover of falling out of the pipeline is through networks of support (Xu, 2008).

Social Networks in Academia

Social networks are defined as the 'individuals people go to for vital professional advice or social support regarding work related activities' (Etzkowitz et al., 2000, pg. 160). The social environment and the social ties than individuals make in academia is a vital part of how one obtains both professional development support (Benbow & Lee, 2018) and psychological support (Shaw, 1954). Academic scientists develop social ties to discuss their work with others and the evidence suggests that the information, support, and advice they access can be a critical foundation for job satisfaction, self-efficacy, leadership roles, and higher-quality practice that improves student outcomes (Benbow & Lee, 2018; Feeney & Bernal, 2010; Parker & Welch, 2013; Siciliano et al., 2018). Research on the networks of college faculty focuses on research collaboration relationships (Gaughan, Melkers, Welch, 2018; Newman, 2001; Siciliano et al., 2018), formal and informal ties on departmental collaborations (Feeney & Bernal, 2010; Quardokus & Henderson, 2015), and teaching-focused networks (Van Waes et al., 2016). At the core of these social networks is the social capital, or social value, that these relationships and collaborations provide to the individuals (Bourdieu 1986; Lin 1999, 2002). Social capital flows through social ties between friends, coworkers, family members, discussion partners, and others and directly or indirectly provides material or non-material resources like information, support, knowledge, advice, prestige, or wealth (Benbow & Lee, 2018). There are mixed findings on how the gender composition of networks may impact outcomes for women. The lack of presence of female faculty in STEM disciplines and the shared academic responsibilities of academics make understanding these social ties of academic women an important part of research.

When women work in highly sex-segregated work environments, gendered stereotypes will make it far more difficult for women to succeed in non-traditional occupation roles (Gutek, 1985; Maranto & Griffin, 2011; West & Zimmerman, 1987). In order for women to be successful in the male-dominated work environment of STEM, they must rely upon the individuals in their network. Research on the networks for men and women find that more women in their networks is associated with better psychosocial support (Ibarra, 1992; Ibarra & Smith-Lovin, 1997). Individuals with social networks that are comprised of large majority of women are better able to receive emotional support.

The resources and information from social networks enable STEM faculty to manage the qualities of STEM labor and practice (Etzkowitz et al., 2000). Female-only networks are found to offer more social or expressive support to women (Coleman, 2010; Feeney & Bernal, 2010; Ibarra, 1992). These outcomes of support that are focused upon the expressive support of well-being is referred to as psychosocial support. Psychosocial support is often seen as roles that serve positive regard and acceptance (Dreher & Ash, 1990), which can come from role models, friends, colleagues, or counselors.

Psychosocial Outcomes in Universities

Psychosocial functions are often observed through mentoring and are found to influence career outcomes because of the positive support that is provided by various individuals (Dreher & Ash, 1990; Kram, 1985). Following the gendered stereotypes placed upon men and women, women are often expected to provide more emotional support compared to men (Guy & Newman, 2004). Nevertheless, investigating the gendered variation of women's networks in STEM within different university types is essential to understand how women's representation in networks affects psychosocial outcomes for female STEM faculty.

Promotion and tenure are important outcomes for faculty success. Professional success and the criteria used to award promotion and tenure include measures of research outcomes (publications & research grants) and teaching outcomes (courses & teaching grants). Another important aspect for faculty success includes receiving information and advice on psychosocial outcomes. Psychosocial outcomes are defined as a combination of outcomes related to psychological and social behaviors that allow individuals to determine their feelings of acceptance and fit with their work environment (Bernstein, Russo, & Paludi, 2008). Individuals that perceive that their workplace with a high degree of psychosocial perspectives are more likely to have positive regard for the workplace and are better able to manage their career (Arora & Rangnekar, 2014; Kram, 1985). In this study, I consider the following items to be psychosocial outcomes for STEM faculty: work-life balance, sense of belonging, and self-efficacy. Faculty members with higher work-life balance, sense of belonging, and self-efficacy are more likely to be effective at both work and other life roles (Chimote & Shrivasta, 2013), are more likely to maximize their skillsets (Berl et al., 1984), and can lead to enhanced individual and organizational performance outcomes (Adams, 2004; Gist, 1987).

Research on outcomes for STEM faculty focuses primarily on the research outcomes in research focused institutions (Bellas & Toutkoushian, 1999). Gender identity and gendered stereotypes are interwoven in different universities types, the workload responsibilities of faculty, and faculty's social networks. The goal of this dissertation is to look at how women STEM faculty's networks shape the psychosocial outcomes in gendered institutions.

Dissertation Organization

This dissertation is organized with the following chapters. Chapter 2 presents research on gendered institutions and psychosocial outcomes in academia. The chapter introduces theories related to gendered perspectives of universities, social identity, social networks, and psychosocial outcomes. Then, I focus on how gendered stereotypes related to female STEM faculty leads to the creation of emotionally support gendered networks. Finally, I present findings from previous and current research to highlight my theoretical model and research focus for this study.

Chapter 3 is a presentation of my hypotheses. These hypotheses focus on how psychosocial outcomes for STEM faculty may be influenced by the following: university type, female STEM faculty, and the proportion of women across three networks (productivity / support/ advice).

I present the data and methods of my study in Chapter 4. Data for my dissertation comes from the Center for Science Technology and Environmental Policy Studies at Arizona State University. The data, referenced as NETWISE II, comes from a National Science Foundation grant focused on women and underrepresented minorities in science and engineering. In this chapter I describe sampling frame, survey design, data collection, and the variables of interest. I also introduce additional supplemental data used in this study. Finally, I introduce the method I use to test my hypotheses.

Chapter 5 presents my model estimation and provides descriptive information on the respondent sample used in my study. I also present the results from the three empirical models in my study. I conclude the chapter with an overview of data limitations in the study.

Finally, Chapter 6 provides a discussion of my findings, the contributions of my study, theoretical limitations, and opportunities for future research.

CHAPTER 2

LITERATURE REVIEW

Women in Academia

The number of female faculty in academia has nearly doubled from 52,000 in 2005 to 123,000 in 2015 (NSF, 2018), yet women in STEM fields remain underrepresented in the United States. As of 2015, women in STEM faculty positions constituted only 37% of academically employed doctorate holders (NSF, 2018). Male-dominated STEM departments are an important context in which to study how women experience and interact in male-dominated work environments. Understanding how both female and male faculty navigate the gendered work environment is of great importance as women are increasingly entering these historically male-dominated work environments. Yet, the literature on women in STEM primarily focuses on publication and research grant outcomes within research-intensive universities, neglecting the experiences of women in teaching intensive universities and other types of outcomes. This research investigates psychosocial outcomes for STEM faculty across all types of universities, focusing on the ways in which gendered networks in gendered institutions affect outcomes. First, I discuss gendered institutions, in particular Acker's four aspects of gendered institutions and how they relate to university work life and STEM. I then introduce the concept of emotional labor, highlighting the gendered expectations attributed to women performing emotional support. Third, I present social identity theory and discuss how relationships may be formed based upon shared gender identity. Fourth, I introduce social network theory and discuss three types of networks analyzed in this research: productivity, support, and advice network. I then note the ways in which gendered networks are important for STEM outcomes. Finally, I present a discussion of psychosocial outcomes in the academy.

Gendered Institutions

Critical perspectives on organizations focus on aspects of control, power, structure, hierarchy, and the labor process (Acker, 1990; Braverman, 1974). The organizational workforce is a make-up of men and women and thus gender is a potential mechanism for sorting organizational control, power, and hierarchy. While early research on gender looks at the differences between men and women as a binary identity (Acker, 1990), gender encompasses more than distinct binary differences and goes beyond simple depiction of individual gender. Organizational structure, the relations in the workplace, work processes, and wages are affected by symbols of gender, processes of gender identity, and gender inequality (Acker, 1990). Joan Acker defines this intersection of gender and organizations as "gendered institutions":

> To say that an organization, or any other analytical unit, is gendered means that advantage and disadvantage, exploitation and control, action and emotion, meaning and identity, are patterned through and in terms of a distinction between male and female, masculine and feminine (Acker, 1990, 146).

Organizations cannot be properly understood without an analysis of gender (Connell, 1987; West & Zimmerman, 1987) as power, control, action, and meaning in organizations is often attributed to masculine characteristics and affects the experiences of feminine gendered individuals and groups. Social structures and interpersonal interactions are integrated within and help to define organizations, which in turn develops gendered institutions (Acker, 1992). Organizations create and reproduce gender divisions of labor, cultural definitions of masculinity and femininity, and ways of articulating individual interests (Grant & Tancred, 1992; as cited by Connell, 2006). Research assumes that masculinity is attributed to men, while femininity is attributed to women (Carlone et al., 2015; Georgi, 2000). Feminine personalities are considered to be nurturing and communal while masculine personalities are considered to agentic and instrumental (Simon, Wagner & Killion, 2016). These gendered personalities are often expressed in gendered occupational cultures in organizations, where masculinity is often viewed as exemplified by a scientist or a manager (Etzkowitz et al., 2000, Wajcman, 2000) and femininity is exemplified by a secretary, school teacher, or caregiver (Ogasawara, 1998; Drudy, 2008). STEM fields are argued to be competitive and abstract and therefore careers within these areas are more likely to be masculine focused (Tenebaum et al., 2005). These occupational roles lead to the biases that certain cultural values are better suited to those that fit the masculine stereotype. When looking at STEM laboratories in research universities male principal investigators (PIs) employ fewer female graduate students and postdocs at significantly lower rates than female PIs that run a laboratory (Sheltzer & Smith, 2014). These limited opportunities for female graduate students in laboratory settings are an example of how men leading these laboratories encourage continued male-dominated workplaces, which ultimately lead to a continued masculine culture in STEM. To better understand gender in organizations, in the next section of this chapter, I discuss Acker’s (1992) four primary aspects of a gendered institution: processes, practices, images, and distributions of power (Acker, 1992).

Aspects of Gendered Institutions

Acker (1992) argues there are four primary aspects of a gendered institution: processes, practices, images, and distributions of power, which exemplify the ways that institutions operate with a masculine focus. Her four primary aspects offer insight into how organizations can negatively impact women in organizations. Women, compared to men, are at a disadvantage in institutions due to the masculine culture that has long been at the core of the majority of institutions. In this next section I highlight Acker's (1992) primary aspects of gendered institutions and how they exist in universities in the United States.

<u>Processes:</u> First, processes help to produce gendered components of individual identity in an organization, where cultural definitions of gender differences and the prevailing beliefs and attitude about gender exist. An example of gendered processes in organizations includes how the choice of appropriate work, language use, clothing, and presentation of self is applied to a member within an organization (Acker, 1990; Connell, 2006; Reskin & Roos, 1987). Masculine identities are often attributed to jobs defined as dirty, physically laborious, positions involving machinery or high technology while feminine identities are often attributed to care work or jobs involving children (Connell, 2006). Women are disadvantaged because the stereotypical woman does not fit the category of an "ideal worker": a person that is free from non-work obligations, such as family or other distractions (Budig, 2002; Williams, 1992, 1995).

<u>Practices:</u> Second, the practices of gendered institutions focus on the construction of the division of labor by gender. This includes the way in which occupations are

perceived as gendered and that the division of paid work and domestic labor is defined historically as “men’s work” or “women’s work” (Acker, 1990; Connell, 2006). For example, when considering the healthcare industry the gendered expectation is that men are doctors and that women are nurses.When considering K-12 education in the United States, women are expected to be teachers and men are expected to be principals. These occupational differences within organizations exemplify the masculine characteristics where men will hold decision-making and higher ranking roles. In these instances, feminine work becomes supportive and lower ranking. Masculinity is not a uniform concept; it is constructed within an institutional context to develop hegemonic masculinity (Connell, 1995; Satteri & Sandefur, 2019). Hegemonic masculinity is developed through historical and cultural conditions where the normative construct is that masculinity is considered to be the “most honored way to be a man” (Connell & Messerschmidt, 2005). For example, within high-tech corporations, technical skills, resulted in the reorganization of the division of labor, defining men’s work as skilled work with technological skills and women’s work as unskilled work with a focus on secretarial tasks and communication skills (Cockburn, 1983; 1985; Cooper, 2000). Hegemonic masculinity as it pertains to practices is also associated with the traditional viewpoint that men must prioritize work over family responsibilities and be the breadwinner while women should place an emphasis on household and family responsibilities (Damaske et al., 2014; Satter & Sandefur, 2019), regardless of whether it is a single or dual income household. Organizational arrangements often exemplify gender divisions of labor, and these expectations of gendered skillsets may influence women's entry into organizations if the division of labor is expected to be geared to "men's work." A study conducted by Moss-Racusin, Dovidio, Brescoll, Graham, & Handelsman (2014) investigated the bias female students in biological and physical sciences experience when applying to faculty positions. Moss-Racusin et al. (2014) finds that both male and female faculty have strong gender assumptions on female applicants, where they are considered to be less competent and less worthy of being hired when compared to a male applicant. When a woman, compared to a man, is hired within biological and physical sciences departments, Moss-Racusin et al., (2014) finds that they receive a smaller starting salary and are given less career mentoring. Budig (2002) argues that, in practice, employers discriminate against women when employers assume that all women are not ideal workers due to the stereotype that women have greater non-work obligations to family than men.

Images: The third aspect of gendered institutions, images, is defined by culture. Gendered images include the stereotypical image differences between men and women as well as the gendered differences in beliefs and attitudes. Stivers (2002) argues that even when women hold positions that should be considered leadership roles, such as a head nurse of a hospital, women are not recognized as such because there is an overwhelming expectation that men are in leadership positions. An image of a top manager and business leader is often attributed to the masculine characteristics of a successful man (Kanter, 1977; Lipman-Blumen, 1980). Images have played a strong role within science textbooks. Good, Woodzicka & Wingfield (2010) find that science textbooks for K-12th graders inadvertently teach young girls that they do not have a place in the field of math and science when they portray gender stereotypes through images of scientists and mathematicians as men and the language references these individuals as he or him. The reinforcement of feminine and masculine traits and images within job roles furthers gendered stereotypes in the workplace (Acker, 1992; Connell, 1987).

Distribution of power: The final aspect of gendered institutions is the distribution of power, where the masculine is an abundance of power and the feminine is a low level of power. Gender relations of power focus on the control, authority, and force (Connell, 2006). In organizations, internal processes in which individuals construct personas or beliefs based upon their gender category or gender identity result in power differentials, typically with feminine personas and identities having less power than masculine identities (Acker, 1992; Tajfel & Turner, 1979). Present and historically, men have dominated the development and leading positions within law, politics, religion, the academy, and the economy (Acker, 1992). Historically, the only institution where women have had a defining, although subordinate role, is in the family (Acker, 1992). Overall, gendered division of power show men in leading roles and positions of power within professional organizations while women, albeit present, are in subordinate roles.

This section highlighted how organizations exemplify gendered characteristics across their processes, practices, images, and distribution of power. Men have been at the core of many of the early organizational developments, with women slowly being integrated into these masculine structuring over time. These gendered characteristics are ever present in the academy today where women are often expected to exhibit more nurturing characteristics than men, are overwhelming given "women's work" in their department and hold a majority of the lower ranks in universities.

Gendered Institutions in Academia

Higher education institutions are gendered institutions (Carrigan et al., 2011; Hart, 2016; O'Meara et al., 2017), where universities are guided by masculine principles of competition, hierarchy, power and control that exclude women and impede their success (Carrigan et al., 2011). Universities are guided by the masculine ideals that inform decisions about faculty pay and promotion (Bird, 2011). University ranking is considered one of the most important competition amongst universities. Since the 1980s, performance and prestige is measured by national and international university rankings (Brankovic, Ringel, & Werron, 2019). The most competitive and dominant model across global university rankings is focused on research focused universities (Marginson, 2015). The allocation of financial rewards for faculty that enhance university financial welfare from grants and publications or other means of financial and reputational gain are often attributed to male faculty members as opposed to female faculty members that may enhance the general welfare of colleagues or invest in the psychological support of students, e.g. the teaching mission (Bird, 2011). Women are shown to perform a disproportionate share of care work in academic departments and spend more time teaching (Bird 1990; Bird et al., 2004). Meanwhile, male faculty members are often overrepresented among university decision makers that develop department and institutional policies and evaluate candidates for faculty recruitment, promotion, and tenure (Bird, 2011; Long & Fox, 1995; Long et al., 1993). These distinct gendered expectations regarding differences in financial rewards, subtle and not-so-subtle forms of discrimination due to their gender, and department service expectations are only a few of the gendered barriers that women in the academy experience (Benokraitis, 1997; Bernstein et al., 2008). Women, both students and faculty, face enhanced gender barriers in STEM fields. STEM disciplines and programs often instill the perception that they are and should be male-dominated (Lee, 2008) and that women are weak within STEM skillsets compared to men (Banchefsky et al., 2016). These stereotypes are reinforced by the historic low representation of women in these fields. These gendered barriers to both students and faculty in STEM fields transcend established gendered stereotypes, resulting in direct sexism in the workplace (Scharrer & Blackburn, 2018).

When looking at the organizational decisions and processes, one particular feminine trait attributed in the workforce is that of emotional labor. Emotional labor includes "softer" emotions, such as being empathetic and sensitive (Guy & Newman, 2004). These emotions, while in many cases performed unnoticed, are a necessary and expected resource for job performance in organizations (Steinberg & Figar, 1999; Karabanow, 2000). Organizations that display and use softer emotions when interacting with individuals provide positive views and elicits desired responses (Guy & Newman, 2004). Emotional labor is gendered, with women being expected and obligated to demonstrate emotions related to showing concern and being sympathetic, caring, and nurturing (Carli & Eagly, 1999; Guy & Newman, 2004; Su & Bozeman, 2016; Wang et al. 2013). Research indicates that women place more value on collegiality and positive interactions than men do in the workplace (Barbezat, 1992; Berstein & Russo, 2008;

Trower & Bleack, 2004). Additionally, because men often find it easier to express emotions to a woman than to another man, they frequently cast women as confidants for emotional support (Martin, 1999). Fox (2003) demonstrated that female faculty put significantly more emphasis on giving help to their advisees to help with social capacity, laboratory participation, making presentation, and interacting with other faculty when compared to men. Bellas (1999) finds that students expect female faculty to be warmer and more supportive when compared to male faculty. These gendered expectations carry over to stereotypes regarding characteristics within university and department settings that are attributed as feminine. For example, female faculty are expected to spend more time mentoring female students (Fox, 2003), providing more service in their universities (Toutkoushian & Conley, 2005), and overall department support (Martin, 1993).

In academic science, a gendered institution in practice might easily accommodate male work patterns or preferences while actively (or inadvertently) excluding female gendered work, including the provision of emotional labor and the need to balance domestic obligations. While commitments to work and family are essential and important to both men and women for healthy adult development (Erikson, 1968; Levinson, 1978; Vailant, 1997), women remain responsible for the majority of the household work and childcare (Mason et al., 2012). While men and women spend relatively equal amounts of time on work-related responsibilities, women spend nearly double the amount of time on childcare responsibilities (Salle, Ward, & Wolf-Wendel, 2016). In a survey of faculty, Mason et al. (2013) finds that male faculty indicate that they spend nearly 20 hours engaged in childcare and they are also more likely to indicate that work-family stress comes from work demands while female faculty report that work-family stress arises from childcare responsibilities (Elliott, 2008; Mason et al., 2013). Additionally, cultural socialization at universities often requires female scientists to choose between successful academic careers and family (Carrigan, Quinn, & Riskin, 2011; Xie & Shauman, 2003), because taking leave while on the tenure track or when managing a laboratory can cause a person (especially a woman) to fall behind on criteria for promotion (Kyveg & Teigen, 1996; van Arensbergen et al., 2012). Thus, some women may be electing not to have families, for fear of failure in the masculine work environment, while those who do have families face increased workload and gendered stereotypes about their commitment to science.

Gendered images can stereotypically assign gender roles to individuals, where emotional labor is linked to women (Lahelma et al., 2014). Teaching is often associated with feminine qualities, while science and research is perceived as masculine. For example, in a study of teaching at the primary level, Drudy (2008) finds the perception that teaching is a woman's job or that it relates to a mother's role is how both school students and student teachers describe a woman's role in teaching. Stahl and Hussenius (2017) examined the standards and values embedded within required national tests of Swedish grade nine students in the natural sciences and finds clear gendered images of individuals in science. The tests reproduced ideas about women/girls as intellectually subordinate to men/boys through images and text passages that present women/girls as less knowledgeable in chemistry and presented scientists, entrepreneurs, and other positive models in science as men (Andersson, 2017).

Power in the academy is defined by leadership, rank, and salary. Men occupy more high-status positions within universities. Men are more likely to be in college leadership positions across all types of universities. Women make up only 8% of presidents leading doctorate-granting institutions, 28% leading bachelor's institutions, and 29% leading master's institutions (American Council on Education, 2017). In 2017, women made up only 35% of deans, department heads, and chairs within four-year colleges (NSF, 2019). In the case of rank and status, women in STEM account for 30.9% of full-time senior faculty (NSF, 2018), a clear distinction that the majority of senior faculty members (those with more power) are men. On average for the 2017 – 2018 academic year, women made up the majority of tenure-track assistant professors in STEM fields at 37.8%, compared to the 24.5% of male tenure-track assistant professors (Roy, 2019). The American Association of University Professors' 2017 – 2018 Faculty Compensation Survey finds that across 93% of reporting institutions – men get paid more than women at the same rank for at least one rank (American Association of University Professors, 2019). These power differentials in the academy are evident across leadership roles, the distribution of women across ranks, and through salary differences. Women that integrate into universities, at any level, experience a very obvious power differential compared to men. Acker and Feuerverger (1996) find that women faculty that try to reach high standards by working hard feel that the academic reward system is out of sync with their efforts. The degree to which gendered differences are apparent and affect female STEM faculty is dependent upon their field of science.

Gendered Fields of Science

While women have experienced gains in participation and status in the workforce, women remain a minority in STEM fields. Research on the gendered differences in STEM highlight reasons why so few women enter into STEM fields and why women choose to leave STEM fields. Some of the reasons that women are assumed to struggle in STEM is associated with gendered processes, practices, images and power differentials. The most common explanations put forth focus on biological differences, women lacking academic preparation, women having poor attitudes towards science, lack of female role models in the field, chilly climates, cultural pressure on gendered norms and the perspective of STEM being considered masculine (Blickenstaff, 2005). While research focuses on reasons why women may struggle in STEM generally, participation and involvement by women varies by STEM field. STEM disciplines vary in their culture, climate, training, and the type of work involved (Su & Rounds, 2015). While STEM fields are assumed to be masculine, they vary in their degree of masculinity (Leslie et al., 2015; Matskewich & Cheryan, 2016). Masculinity differences in STEM fields is related to long held gender perceptions and expectations. There are two reasons why women are more or less represented in particular STEM disciplines: educational experience and interests.

Research that focuses on the gender differences of women in STEM finds that women are less likely to indicate interest in STEM fields at a young age due to gender expectations and assumptions of math and science skillsets. Math and science achievement are found to favor boys from a young age and across levels (Lee & Burkam, 1996), where images and processes often portray men within these STEM fields more than women. Dar-Nimrod and Heine (2006) find that these gender stereotypes, where women are assumed to have lower abilities in math and science compared to men is one reason that prevents women from pursuing certain types of STEM fields. Based on these gendered organizations of the expectations and assumptions in STEM fields, young girls develop lower self-assessments of their skillsets (Ma, 2011). Ma (2011) argues that STEM disciplines differ in the extent of being math and science intensive and that this is a large indication of why women are more likely to be in some disciplines over others. Engineering is considered to be far more math intensive than life sciences such as biology (Ma, 2011; Storer, 1972). These gendered early educational experiences are why researchers argue that women's presence in more math and science intensive fields in STEM is lower. Gendered expectations on women's achievement in math and science based upon early education is one example why researchers believe women select particular STEM fields of interest more than others.

Interests are another reason research argues women select certain types of STEM disciplines. Women, compared to men, prefer work environments that provide opportunities and activities to work with people (Su et al., 2009; Diekman et al., 2010; Su & Rounds, 2015). Due to gender socialization, women are more likely to have values associated to interacting and helping people which draw them to fields related to teaching, nursing, and medical science (Su & Rounds, 2015). Physical sciences and engineering are perceived to be low on social values related to interacting and helping people, which is why women are less likely to be drawn to these STEM fields (CITE).

Based on these perspectives, women's interest and participation in STEM fields is more concentrated in the fields of biology, chemistry, and mathematics compared to fields such as engineering and physics (Cheryan et al., 2016). These beliefs on gender differences in education and interests along with variation in women's participation rates in STEM illustrate the gendered aspects of STEM institutions.

University Types

The gendered aspects of institutions carry over into the overall structure and categorization of universities. As noted earlier, many universities perceive research as a masculine gendered activity, while teaching is viewed as feminine gendered. The Carnegie Classification classifies universities based on different dimensions and is the most cited method for understanding the differences in university institutions (Gleason, 2017). These classifications include degrees granted, research or teaching focus, and types of students served. For example, within four primary types of universities (e.g. research extensive, research intensive, Master's I and II, and Baccalaureate) there are Hispanic serving institutions, historically black colleges and universities, women's colleges, and liberal arts colleges. Historically, universities have been distinguished by research and teaching focus. Over the 20th century, as women became integrated into faculty positions, the distinction between research focused and teaching focused aligned with gendered stereotypes (Bird, 2011). Reports by the National Science Foundation (NSF) and AAUP on STEM faculty and STEM outcomes are often associated with only research focused universities. This focus has created a division with research focused universities as high achieving against all other types of universities. This division creates a comparison of doctoral granting research intensive and research extensive institutions as “research-focused universities” to “teaching-focused universities,” or the Masters I & II and Baccalaureate universities.

Gendering of Institution Types

The historical structuring of gender in universities clearly emphasizes how masculine principles dominate academia. There is also a bifurcation of university types by gender, with research universities embodying masculine traits and teaching universities being more feminine in nature. Women faculty were commonly excluded from research-focused universities, which are more highly valued by society and in academic circles, and over-represented in teaching focused universities (Rosenberg, 1988). This clear distinction where women and men dominate in different types of universities embodies the gendering of universities. These different types of universities translate further within the academy in how accomplishments are viewed and rewarded by male and female faculty.

Faculty at all universities are obligated to three primary areas of work: research, teaching, and service (Tierney & Bensimon, 1996), though the balance of these three work areas varies by university type. The gendered organizational logic presumes that research publications, research grants, and certain kinds of research are more masculine and therefore highly valued in many universities (Hart, 2016; Schiebinger, 2014). Traditionally, research publications and research grants are considered one of the highest promotion standards for faculty members, especially at research-intensive universities. There are mixed findings related to publication differences between men and women faculty. Research indicates that compared to men, women produce fewer publications on average (Long & Fox, 1995; Symonds et al., 2006; van Arensbergen et al., 2012). While women are found to publish at a significantly lower rate than men, their research publications have a higher impact within their respective disciplines (Duch, et al., 2012; van Arensbergen et al., 2012). Even within research focused universities, women in STEM are more likely to be assigned heavier teaching and service responsibilities (Bailyn, 2003; Carrigan et al., 2011; Riffle, 2013) compared to their male counterparts, thus reducing time for research productivity (NRC, 2007). The underrepresentation and barriers that women face within research-focused universities is a well-documented. Yet little research investigates how these gendered workloads affect women in teaching-focused universities.

Teaching-focused universities are associated with non-doctoral granting universities where the emphasis is on teaching-based outcomes such as teaching grants and course development. Generally, demographic data indicates that the majority of women and minority faculty are concentrated in less prestigious two- and four-year colleges, with women being represented at higher rates within these teaching-focused universities (Riger, Stokes, Raha & Sullivan, 1997; West & Curtis, 2006). Female faculty roles in gender based universities, such as women's colleges and liberal arts schools, is also another way in which teaching-focused universities are labeled as feminine gendered. In an article for U.S. News & World Report, Cassidy (2016) states that women's colleges will in themselves provide better opportunities for female students and female faculty due to the built-in sense of belonging and female majority because they are represented by a majority of women. When looking at the proportion of women in STEM leadership within universities, women's colleges and liberal arts schools have a stronger representation compared to research focused universities (McCullough, 2019). In a commentary in The Chronicle of Higher Education, Karukstis (2009) indicates that since 2001 the National Academies has released reports on gender differences and transitions of STEM faculty but that these only focus on research-focused universities and overlook women in non-research-focused universities. Karukstis (2009) argues that reports about gender by NSF and American Association of University Professors (AAUP) typically focus on research focused universities and minimize critical situations at teaching focused universities which lead to the idea that gender equity may exist. Teaching-focused universities encompass a feminine gendered environment through the representation of women and the teaching focus that is associated as "women's work", yet we don't know whether female STEM faculty experience the same or differing levels of gendered exclusion and outcomes as compared to their male counterparts. Female STEM faculty may do better in these more feminine gendered institutions. They may not.

Social Identity Theory

Social identity theory (SIT) and the related social categorization theory (SCT) argue that individuals are likely to use salient social categories (e.g. gender) as indicators of value. These social indicators typically preference similarity leading individuals to create groups based on ties to others who share their social identity (Schneider & Northcraft, 1999; Simon & Hoyt, 2008; Tajfel & Turner, 1979; Turner, 1985; 1987).

Visible characteristics, such as race, gender, or ethnicity, are most frequently used for social categorization (Rothbart & John, 1993; Stangor, Lynch, Duan, & Glass, 1992).

Through social categorization, individuals are perceived as either members of the same category as one's self (in-group) or as members of the other group (out-group) (Tsui et al., 2002). Based upon this, Turner (1984) states that a member of a psychological group does not need to interact with or like other members, or be liked and accepted by them, the individual would only need to fit the group membership (Ashforth & Mael, 1989). Social identity is often used in demography research that asserts that variation in demographic composition of work groups or teams affects outcomes such as cohesion, communication, and performance (Williams & O'Reilly, 1998). When a social category that is underrepresented is present in a group it is likely to become salient as a basis for categorization (Kanter, 1977). The differences of individuals from one another within a group setting is often referred to as relational demography – individuals define their groups in relation to other groups (Cohen & Broschak, 2013; Williams & O'Reilly, 1998).

Building upon SIT, relational demography further explains how categories of social identity interact and influence one another in organizational settings. Relational demography is defined as individuals comparing their own social identities with others in their groups or organizations to determine if they are similar or dissimilar to the group composition (Tsui et al., 1992; Tsui & O'Reilly, 1989). Organizational characteristics, such as group composition and gendered structuring, are likely to develop comparison and attribution processes by shaping the values individuals attach to groups within organizations (Acker, 1990; Ely, 1995). Experience of being similar or dissimilar from the members of one's group is contingent upon whether a member is a part of a high-status or low-status identity group (Chatman & O'Reilly, 2004; Chattopadhyay, 1990). Demographic attributes of individuals in a group are proposed to affect the individual's work-related attitudes and behaviors (Riordan & Shore, 1997), which can facilitate rapport-building owing to shared experiences, values, and worldviews and enhanced empathy (Riordan, 2000).

Once social categorization occurs, stereotypes, biases, and prejudices occur based upon gender differences (Williams & O'Reilly, 1998). Social identity is significant through comparisons between groups (men and women) when status differences between groups are salient (Ely, 1995). Gurin and Townsend (1986) specified three components of women's identity: perceived similarity to other women, the perception of common fate (i.e. a belief that women are treated similarly based on their group membership), and centrality of group membership to the self (Cameron & Lalonde, 2001).

Women are identified as low-status across many settings, including STEM fields (Fox, 2010; Jost et al., 2004; Ridgeway, 1991; Sidanius & Prato, 1999; Wood and Eagly, 2002). When taking into account the difference between men and women in high-status and low-status identities, gender allows people to find similarity or dissimilarity in views and choices, which can result in certain interactions (Konrad et al., 2010). For example, if women are perceived as lower status or are doing lower status work, that status becomes associated with all members of the group – regardless of performance. Similarly, if men as the ingroup are perceived as higher status and more valuable to the organizations, that stereotype will be reinforced in male dominated, masculine gendered organizations.

Individuals will maximize intergroup distinctiveness by seeing in-group members as more attractive, trustworthy, honest, and cooperative than members of the out-group (Tsui et al., 2002). Riordan and Shore (1997) state that when an individual uses gender as a category, the individual may be most attracted to and satisfied in groups that are composed of members within the same gender category because the group contains an important part of the individual's existing identity (Tsui et al., 1992). Gender composition is an important expression of the social culture of the organization, where composition of women in work groups has consequences for workers and organizations (Martin, 1985; Pfeffer, 1983; Reskin, McBrier, & Kmec, 1999).

Research drawing on gender composition emphasizes that the proportion of women, or the sex ratio, in organizations can influence outcomes for women and the organizations themselves (Blau, 1994; Kanter, 1977; McGinn & Milkman, 2013; Tolbert et al., 1995). Kanter (1977) studied the particular proportions of women in predominately male groups to understand the interactions of face-to-face groups with highly skewed sex ratios. When women are the numerical minority, their group visibility is heightened which can lead to stereotypes and negative perceptions from men (Kanter, 1977; Reskin et al., 1999). Blau (1994) argues that the smaller the disparity in the sex ratio, the greater likelihood of interaction and the more likely the majority will not avoid interacting with the minority. In other words, when there is heterogenous gender composition in an organization, the more likely each group interacts with one another. The consequence of composition differences is that “the dominant group enjoys the power to adversely affect groups that are considered a threat” (Reskin et al., pg. 345, 1999).

Interpersonal attraction and trust are higher in homogenous work-group formations (Reskin et al., 1999). Wharton and Bird (1996) find that the percentage of women in university departments is related to workers’ perception of cohesion. These homogeneous work-group formations are developed through the types of relationships, or networks, formed by individuals. Therefore, when more than one woman is present in a department, other women may be more likely to form relationships based upon their in-group characteristics of being female faculty. Female STEM faculty’s social identities may be closer aligned to one another, when compared to male STEM faculty, as their educational experiences and values may be similar.

Networks

The members of organizational groups, or social networks, provide information, validation, or encouragement through interpersonal relationships and connections that are developed (Adler & Kwon, 2002; Etzkowitz, 2000). Social networks shape how individuals obtain and provide information, resources, support, and advice (Adler & Kwon, 2002; Benbow & Lee, 2018). Research on social networks emphasizes the importance of how embedded an individual is in networks for their exposure to information (Granovetter, 1973; 1985). Social networks in organizations are commonly split between formal and informal networks. Formal networks are a formally structured relationship division between members in an organization with clear established hierarchies or roles (Ibarra, 1993). Informal networks, also referred to as emergent networks, are relationships with individuals in a workplace that can develop either through work related means, socialization of actors, or a combination of the both (Ibarra, 1993; Xu & Martin, 2011). The majority of research on social networks focus upon two types of informal relationships: instrumental and expressive networks.

Instrumental networks are an individual's connection with contacts or ties that exchange job-related resources. Expressive networks are characterized as relationship ties that provide social support and friendship (Ibarra, 1993; Ibarra & Andrews, 1993). Organizational phenomena are influenced through informal networks because formed attitudes, perceptions, and beliefs are socially constructed (Ibarra & Andrews, 1993; Podolny & Baron, 1997; Salancik & Pfeffer, 1978). The clustering of individuals within a network is characterized by interaction and ties (Freeman & Webster, 1994), where the relationships are often based upon positive sentiment, a shared sense of experience, and similar social identities (Brands, 2013; Fiske, 1992; McPherson, Smith-Lovin, & Cook; 2001). The clustering of individuals are often influenced by the salient gendered identifies of faculty members.

Gendered Networks

A prevailing argument within social network theory is that social identity, such as gender, leads to the composition of group memberships based upon these characteristics (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Research on gender composition of networks, where contact between similar people occurs at a higher rate than dissimilar people is referred to as "homophily" (McPherson, et al., 2001). Homophily research shows that individuals are more likely to communicate with others that are similar to themselves (Burt & Reagan, 1997; Ibarra, 1992; Marsden, 1987; McPherson et al., 2001). Same-gender interactions are an explanatory factor as to why social networks are segregated by gender (Konrad, et al., 2010; McPherson et al., 2001). While women may have access to cross-sex contacts (heterogenous groups), these relationships may be more difficult to form, inducing women to create ties amongst themselves (Ibarra, 1993). When institutions are gendered, where sex differences are obvious, women are expected to have more same-sex or homophilous social networks (Belliveau, 2005). In their study of six departments in a federal agency, the proportion of women in a work group was positively associated with support for advancement that men receive from coworkers and negatively associated with support that women receive from men (South et al., pgs 274-276; 1987). These expected homophilous relationships may also influence the perceptions of affiliation patterns, where individuals that interact with one another frequently are grouped together (Freeman, 1982) and those that do not are grouped into another (Freeman & Webster, 1994). These perceptual affiliation patterns in male-dominated institutions lead to the expectation that women will group together because of the difficulty in integrating with men.

Brands (2013) argues that ties that are perceived within a group may be more informative than the ties that actually exist. When considering gender biases as they relate to men providing greater task-related competencies, men are more often to be sought after for instrumental contacts for both men and women (Ibarra, 1992). When attributing gender to the composition of networks, the extent to which women are perceived to provide emotional labor, leads to the assumption that groups of women will be more likely to provide emotional support to an individual (Brands, 2013; Kilduff & Krackhardt, 1994). Research on expressive networks finds that both men and women appear to include more women in their friendship and support networks (Ibarra, 1992; Xu & Martin, 2011). These gendered expressive networks are likely to develop from the proximity of individuals within departments. As individuals within departments interact and form relationships the values of these connections develop.

Social Capital Theory

Social capital theory defines the actual or potential resources, such as information and support, that are embedded in social networks (Adlwer & Kwon, 2002; Bordieu, 1985; Coleman, 1990). Social capital can influence career success (Burt, 1992; Gabbay & Zuckerman, 1998), can facilitate resource exchange (Tsai & Ghashal, 1998; Nahapiet & Ghashal, 1998), and can reduce turnover of workers (Krackhardt & Hanson, 1993). Social capital's "sources lie within the social structure in which the actor is located in" (Adler & Kwon, pg. 18, 2002) and is characterized as resources that are gained through the exchanges of individuals (Mouw, 2006; Burt, 2000).

Social capital develops out of the interactions of members where reciprocity governs exchanges (Etzkowitz et la., 2000), knowledge sharing occurs (Powell et al., 1998), and social support is developed from the members within a network (Coleman, 1988; Etzkowitz et al., 2000). A benefit of social support in work environments is that it can moderate negative work conditions (Gillespie et al., 2001). Collective value of social capital is an important factor in organizational behavior (Timberlake, 2005) because an individual's positive perceptions of the work environment can be shaped by socio-emotional aid from their colleagues and supervisors (Gillespie et al., 2001; Posner & Powell, 1985). Social support in the workplace improves work life for individuals and research indicates that the accumulation of social capital varies by gender (Burt, 1992; Granovetter, 1973; Ibarra, 1995).

All workers, regardless of gender, rely on support and information from their colleagues. Research indicates social capital in the workplace varies by gender. Men's social capital is typically more job orientated while women's social capital centers on the provision of encouragement and advice (Bakker et al., 2002; Marshall, 1993; Kathlene, 1995; Ibarra & Andrews, 1993). Ibarra (1997) finds that while men may broker within networks for social capital such as power and information, women gain access to networks by bringing information and ideas into the network. Overall, the type of social capital available to both men and women depends on organizational type and setting.

Examples of social capital in the academy include information and feedback, informal introductions, opportunities, socio-emotional support, and financial resources (Coleman, 1989; Burt, 2000). When considering social capital and gender in academia there are mixed findings. Research finds that women face pressures that block the creation of social capital due to work environments that are better suited to masculine focused instrumental outcomes (Kanter, 1977; McGuire, 2000; Thomas, 2002; van Emmerik, 2005). These pressures on women lead to a lack of resources and barriers in career progress (Carre & Rayman, 1999; Duberley & Cohen, 2010). In contrast, Barthauer, Spurk & Kauffeld (2016) find that female researchers possess larger developmental networks and therefore have more social capital and are able to have greater brokerage within the networks. Social capital differences in the academy generally vary by gender, where women have larger networks and men have denser networks (Barthauer et al., 2016). Relationships and the social capital within these networks are an important part of a faculty member's success in a university. These social networks provide various types of resources and support for faculty members, where faculty may turn to specific individuals for information on department culture, self-improvement, and general advice.

Network Types for STEM Faculty

Social networks for STEM faculty are important for advancement in the work place and to advance science and teaching outcomes at universities (Feeney & Bernal, 2010; Gaughan et al., 2018; Siciliano et al., 2018; Welch & Ja, 2015). This research focuses on three types of academic networks: Productivity, support, and advice. Productivity networks are comprised of individuals that are collaborators or provide information regarding the research and teaching outcomes of the academy such as publications, classroom issues, and grants. Social network studies on academics in STEM focuses on research collaboration relationships (Fox, 2005; Gaughan et al., 2018; Newman, 2010; Siciliano et al., 2018), where research productivity and grant awards are the central outcome of interest (Etzkowitz, 2000; Siciliano et al., 2018). Teaching is another type of collaboration relationship for STEM faculty (Gaughan et al. 2018; Roxa & Martensson, 2009; Van Waes et al., 2016). Outcomes from teaching collaborations include obtaining information or resources on previous teaching experiences and course preparations (Van Waes et al., 2015; 2016). Collectively, these research and teaching collaborations develop a faculty member's productivity network.

Support networks are relationships that provide academics with a sense of inclusion and influence by providing information regarding academic positions, introductions to individuals outside of the university to bridge ties, reviewing of work prior to submission, and advice on work-life balance matters (Etzkowitz et al., 2002, Feeney & Bernal, 2010; Gaughan et al., 2018; Jasmes, James, & Ashe, 1990; Spreitzer, 1995). Acceptance and recognition from other individuals (personal or professional) are essential for creating an inner sense of role competence (White, 1970). The social relationships of academics are integral for professional development (McLaughlin & Talbert, 2001) and inclusive support (Coleman, 2010). Support networks allow faculty to obtain information and resources that may not otherwise be formally given in their departments.

Advice networks include individuals that provide advice regarding career decisions and university and department norms and culture (Feeney & Bernal, 2010; Gaughan et al., 2018). When STEM faculty are able to receive advice from their colleagues' feelings of approval and validation often results from the interactions (House et al., 1988; Welch & Jha, 2015). While faculty may be able to access information to university and department information through formal channels, personal relationships that provide advice are better able to provide better psychosocial support (House et al., 1988). Advice networks allow faculty to reduce stress and increase confidence by turning to close individuals that can provide solutions to career related problems (Higgins, 2000; House et al., 1988; Welch & Jha, 2015).

Just as institutions and work environments are gendered, the social relationships and composition of STEM faculty's productivity, support, and advice networks are gendered. They can be gendered in the composition of the network (e.g. proportion of men and women) and in the type of resources in the network (e.g. emotional support, competitive advantage). Early research argues that social ties to men serve as more valuable network ties than those to women since men generally obtain better labor outcomes and are the dominant group in the workplace (Extejt & Russell, 1990; Ibarra, 1992; Winberger 1998). McPherson and Smith-Lovin (1986) suggests that sex segregated, or female-dominated organizations may adversely affect women's attainment by limiting their access to diverse social ties (Beggs & Hurlbert, 1997; Belliveau, 2005). Women in organizations face constraints in building instrumental networks with different network structures to succeed (Brass, 1985; Ibarra, 1992, 1993). More recent scholarship finds that women in female networks receive more beneficial outcomes than women who are in male networks. Women seeking leadership roles are more successful, reaching higher leadership placement, when there are more women in their networks (Yang et al., 2019). Additionally, 77% of women in prestigious job placements have an inner circle of strong ties to two or three women who communicate intensely with one another and low-placing women have a male-dominated network with weak ties to other women in their network (Yang et al., 2019). Thus, there are competing hypotheses about whether faculty benefit more from developing female or male dominated networks to access resources and if gendered differences in network composition vary for men and women.

This section focused on how social networks for faculty vary in the types of resources, information, and support they can provide to faculty. Faculty's interactions in the workplace are dictated by the workflow positions they are in such as their universities and more importantly their specific departments (Brass, 1985; Ibarra & Andrews, 1993). Inclusion within these productivity, support, and advice networks are therefore more likely to include those within the same departments due to the proximity in which individuals work with one another (Brass, 1985). Research finds that increased psychosocial support from social networks can lead to more confidence and decreased stress (Cross et al., 2001; Higgins, 2000). Researchers find that social influence from individuals that work closest to faculty members across different networks lead to numerous publication and grant opportunities (Gaughan & Bozeman, 2016; Siciliano et al., 2015). What is less clear is the ways in which STEM faculty's departmental social networks may influence psychosocial outcomes.

Psychosocial Outcomes

A majority of research on faculty outcomes focuses on outcomes associated with academic production such as publications, research collaborations, and research grants (Cummings & Kiesler, 2007; Gaughan & Boozeman, 2016; Kyvik & Teigen, 1996; Parker & Welch, 2013; Siciliano et al., 2018; Welch & Jha, 2015). With the exception of Bernstein et al. (2008), a limited amount of research focuses on a psychosocial perspective of academic work to illuminate factors of how STEM faculty view their fit with their work environment. Bernstein et al. (2008) propose that the “key to understanding career persistence and outcomes from a psychosocial perspective is the individual’s perception about fit with the work environment, her success in negotiating disjunction to improve fit, and the choices she makes as a result” (pg. 2). Psychosocial perspectives include a combination of psychological and social behaviors, which are commonly examined in the mentoring literature. These psychosocial perspectives are often attributed to outcomes related to an individual’s sense of competence, identity, and work-role effectiveness (Allen & Eby, 2004; Berstein et al., 2008; Feeney & Bernal, 2010; Kram, 1985; Noe, 1988). Research finds that positive regard for the workplace and the ability to discuss and manage anxieties related to work-life issues are important indicators of psychosocial functions (Arora & Rangnekar, 2014:2015; Kram, 1985; Noe, 1988; Ragins & Verbos; 2007) and ultimately individual career outcomes and organizational success.

Compared to men, women have different experiences related to psychosocial outcomes in the workplace. The empirical results related to psychosocial functions show that women are more likely to report that they receive more psychosocial support from women than men in the workplace (Burke, 1984; Ibarra, 1993; Noe, 1988). Thomas (1990) and Ibarra (1993) find that individuals with same-gender relationships report receiving more psychosocial and career-development mentoring than individuals in cross-gender relationships. Allen and Eby (2004) find that women provide and receive more psychosocial support than men.

Psychologists and vocational development theorists argue that high-achieving women have characteristics associated with high self-esteem and that these women are influenced by a complex interaction among various individual characteristics with an array of external and social influences (Betz & Fitzgerald, 1987; Fitzgerald & Harmon, 2001; Gomez et al., 2001; Richie et al., 1997). The psychosocial outcomes that faculty members receive are influenced by the types of relationships that are formed in the workplace – in particular relationships with male and female colleagues within departments. Proximity to others in departments allows social relations to occur face-to-face, have spontaneous communication, interact informally, and increase collaboration (Alderfer, 1987; Cummings & Kiesler, 2007; McPherson & Smith-Lovin, 1987; Uzzi & Spiro, 2005). Social networks for STEM faculty that are comprised of emotional and supportive network members may influence psychosocial outcomes. In this study, I use the term psychosocial outcomes to refer faculty member's psychological and social perspectives of their organizational environment. I focus on three types of psychosocial outcomes: work-life balance, sense of belonging, and self-efficacy.

Work-Life Balance.

Work-life balance is the art of managing paid work with all other activities that may be important to people such as family, friends, and leisure and recreation (Dundas, 2008; Watts, 2009). The purpose in wanting to achieve work-life balance comes out of the desire to remove issues of work-life conflict. Work-life conflict is associated with lack of engagement, absenteeism, turnover rates, low productivity and poor retention levels (Chimote & Shrivasta, 2013). In removing work-life conflict and creating a balance between work and life, individuals are able to be more effective at work and in other life roles as well as have more positive behaviors (Chimote & Shrivasta, 2013; Qu & Zhao, 2012). Achieving work-life balance is critical for self-care and overall personal wellbeing. Managing work and caring roles amongst other life stressors can impact individuals psychologically and therefore adequately managing work-life balance is important. Resources such as support and care from family, friends, and close colleagues provide individuals with the ability to obtain input about work-life conflicts (Tomlinson, 2007). Therefore, professional relationships are influential for information and resources regarding how to obtain work-life balance.

Sense of Belonging.

The concept of sense of belonging is central to the psychological well-being of individuals. Sense of belonging is key for both individuals and organizational culture as it increases the tendency for individuals to create positive long-term relationships with one another and embrace individual work objectives (Carron, 1982). Belongingness is a key concept across theories of motivation and relationship building (Alderfer, 1972; Berl, Williamson, & Powell, 1984; Ivancevich & Matteson, 2002; Maslow, 1962). Sense of belonging develops at the individual level where relatedness across others is developed by meaningful interpersonal interactions where social relationships are key (Alderfer, 1972; Ivancevich & Matteson, 2002). Research on the belonginess finds that it is a fundamental human motivation (Baumeister and Leary, 1995). Contact with another is a key concept of sense of belonging, where there is a need for friendship, affiliation, interaction, and love (Ivancevich & Matteson, 2002, pg. 151). When considering the work environment, sense of belonging comes from the contact and relationships built with peers (Berl et al., 1984). Berl et al. (1984) argue that individuals cannot accept responsibility and maximize their skillsets in their organizational environment without achieving first feeling a sense of belonging. This concept of sense of belonging is supported by Social Identity Theory and Social Network Theory which indicates that how individuals define themselves and their views of membership are based on their interactions and relationships.

Self-efficacy.

Self-efficacy is defined as one's belief in one's capabilities to succeed or be successful in a particular setting or to meet situational demands (Bandura, 1977; 1994; 2006). Self-efficacy develops through complex cognitive, social, linguistic, and/or physical skills gained from personal experiences (Bandura, 1982). Self-efficacy develops from individual reflection and integration of capabilities which can lead to certain choices and efforts (Bandura, Adams, Harly, & Howells, 1980). Research finds that perceptions of self-efficacy can lead to both individual and organizational performance outcomes (Barling & Beattie, 1983; Gist, 1987). Self-efficacy is also an important predictor of behavioral outcomes and can influence motivation (Adams, 2004; Bandura, 1997; Hemmings & Kay, 2016). Research finds that the willingness to share information and having positive relationships amongst peers is a significant predictor of self-efficacy (Chester & Beudin, 1996; Siciliano et al., 2016). Evidence suggests that these social networks where individuals can gather information, knowledge, and support help shape self-efficacy beliefs by identifying the access of resources to overcome challenges and obtain advice (Daly, Moolenaari, Bolivar, & Burker, 2010; Ibarra & Andrews, 1993; Mulholland & Wallace, 2001; Rosenholtz, 1991). When looking at educational settings, studies find that collaborations and peer willingness to share information are significant predictors of self-efficacy (Chester & Beudin, 1996; Rosenholtz, 1991; Siciliano, 2016). Thus, networks that provide information, knowledge, and support are crucial for self-efficacy.

In this study, I focus on how informal networks influence psychosocial outcomes. First, how informal networks influence perspectives of work-life balance in the workplace. Second, how informal networks influence the perception of a faculty's member fit with their work environment and department culture. Finally, how relationships within informal networks influence a faculty member's view of their efficacy in their department. Whisle productivity outcomes from STEM faculty networks are widely studied, the psychosocial outcomes, as an output of social networks has yet to be examined from a perspective of gendered institutions and networks.

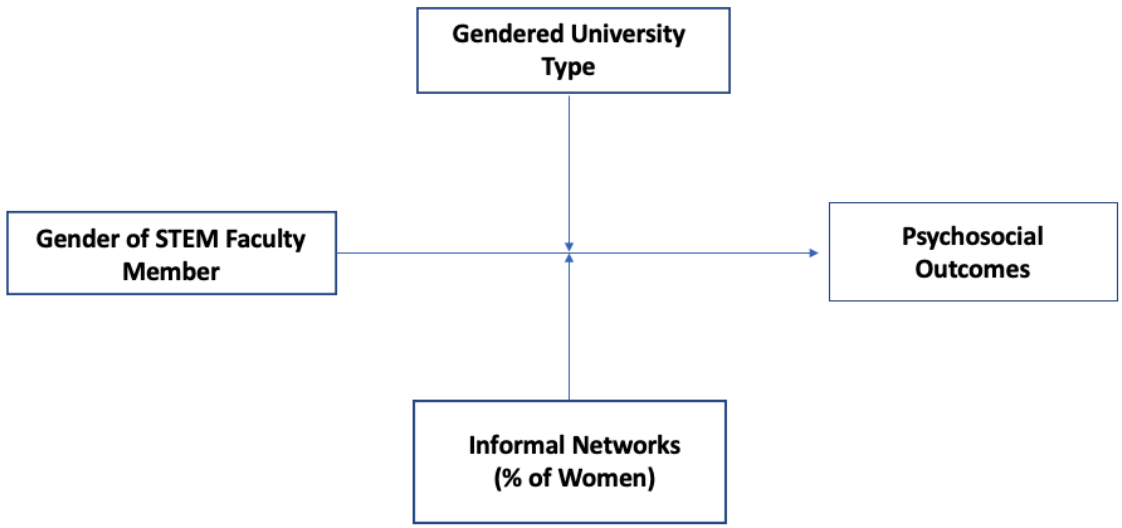
Informal networks in gendered institutions for STEM faculty

The organizational reality for both men and women in STEM fields, which are predominately male-dominated, is that their experiences and perceptions of the organizational environment may differ based upon gender differences. This research investigates the following question: *Does the proportion of women in informal networks influence psychosocial outcomes within gendered university settings?* Sheppard (1989) notes that while women continue to demonstrate their capacity for succeeding in "men's work", women are experiencing a work reality that differs from men. These perceived gendered differences, such that women provide the majority of emotional labor in work environments, imply that organizational experiences and psychosocial outlooks within the organization are influenced by the composition of women in STEM faculty's department social networks. Individuals that receive emotional support that provides encouragement, encourages the discussion of issues and fears, and provides an environment to discuss workplace improvement is an example of psychosocial outcomes (Noe, 1988; Waters, 2004). Literature on gendered networks finds that both men and women turn to women for emotional support or friendship (Ibarra & Andrews, 1993; Ibarra, 1993). This research further extends this view of gendered stereotypes – that women are considered to be sources of emotional support – and argues that female and male STEM faculty with these informal networks will experience different types of psychosocial outcomes in their department based upon the gendered university type.

The theoretical model presented here (Figure 1) proposes that STEM faculty (men/women), their level of gender representation (percent women) in informal group networks (productivity, advice, and support) influences perceived psychosocial outcomes for STEM faculty across two university types (research/teaching).

This chapter introduced theories and concepts related to emotional labor, social identity theory, social networks, social capital theory, and psychosocial perspectives. Drawing from previous research and these theories, I expect that department networks, as an outcome of social identity and relational demography, will lead to social capital from these emotionally supportive networks which ultimately shape psychosocial outcomes for male and female STEM faculty within gendered university settings. The next chapter details the hypotheses for this study.

Figure 1. Theoretical model: Psychosocial outcomes for STEM faculty (men & women) across university type (research/teaching) based on informal networks (% of women)



CHAPTER 3

HYPOTHESES

This chapter outlines the hypotheses of this study. The previous chapter established the theoretical context for understanding gendered institutions, gender composition, social capital for academics, network types, and psychosocial outcomes for STEM faculty. Social Identity Theory, Gendered Institutions, Social Capital Theory, Social Networks provide insights into how network types and the gendered composition present in those networks shape work-life balance, sense of belonging, and self-efficacy outcomes for STEM faculty.

This chapter is organized as follows: First, I discuss why psychosocial outcomes are important in the workplace. Second, I discuss how universities can influence faculty perceptions on three specific measures of psychosocial outcomes (work-life balance, sense of belonging, and self-efficacy). In specific, I discuss how STEM faculty working in research focused universities, compared to teaching focused universities, may have lower levels of psychosocial outcomes. Third, I focus on how STEM female faculty, compared to male STEM faculty, may experience lower levels of psychosocial outcomes within their departments. Finally, I discuss how informal networks with a higher proportion of women in a network, may lead to increased levels of psychosocial outcomes for STEM faculty.

Psychosocial Outcomes for STEM Faculty

Social and psychological factors of the work environment provide insight into how individuals connect, advance, and support the organizations where they work

(Kuntz, 2012; Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004). Perceptions of these social and psychological factors such as mental well-being, support, control, and work demands are aspects of the psychosocial work-environment (Allen & Eby, 2004; Elwér, Johansson, & Hammerström, 2014; Feeney & Bernal, 2010; Kram, 1985; Noe, 1988). Research on psychosocial outcomes finds that positive regard for the workplace and the ability to discuss and manage anxieties related to work-life issues are important indicators of psychosocial functions (Kram, 1985; Kuntz, 2012; Noe, 1988). When there are negative perceptions of the work environment individuals may experience a variety of negative health outcomes both physically and emotionally (Elwér et al., 2014; Riger, Stokes, Raja, & Sullivan, 2004). Examples of psychosocial outcomes include work-life balance, sense of belonging and self-efficacy. Prior studies argue that social networks, where individuals can obtain information, knowledge, and support can be influential for these three psychosocial outcomes. These psychosocial outcomes are only some of the ways in which faculty view their organizational environment.

Research and Teaching Focused Universities

Universities are important organizations within communities, as they provide benefits through educating students, assisting local communities through research and community engagement, and provide support to the academic community widely through research and teaching. Universities are broadly categorized as two types: research focused and teaching focused. Both of these university types are deeply involved with the education of students but promotional standards for faculty members and the primary focus of these universities is dictated by the categorization of research versus teaching focuses. For example, research focused universities place a higher emphasis upon the publications of their faculty based upon the academic journals and the allocation of research grants for tenure and promotion opportunities. Alternatively, teaching focused universities are less stringent on their faculty with publications but more focused on their teaching portfolios and ability to receive teaching grants for tenure and promotion opportunities. Historically, higher education was primarily focused upon masculine aspects in their development and growth. Today, universities are the products of these long held masculine characteristics with one type of university, research focused, being considered more prestigious and dominate. Below I consider how university types encompass gendered perspectives in their structuring.

Gendered Universities

During the 20th century, male faculty and students dominated almost all types of academic disciplines with the exception of feminine gendered areas of study (e.g. home economics) (Woody, 1929). During the post-World War II era, the development of masculine and feminine gendered disciplines developed which served male and female students, respectively. There were clear differences with research universities being focused on research and liberal arts colleges being labeled as teaching-focused universities (Bird, 2011). Women were over-represented in teaching colleagues and in applied disciplines and were generally excluded from research-intensive disciplines (Rosenberg, 1988). Teaching historically has been seen as women's work (O'Neill, 2005) and is closely aligned with the expectation that women should be caring and nurturing (O'Connor, 2006; Mariskind, 2014; Nodding, 1984). Thus, universities have historically been viewed as gendered institutions – higher-ranking, higher prestige, higher-salaries within which developed these gendered expectations that research universities exhibit masculine dominance and teaching colleges exhibit lower feminine views.

University type: Work-life balance. Work-life balance is defined as the ability to balance personal and family life with paid work (Dulk & Groeneveld, 2012; Facer & Wadsworth, 2008; Feeney & Stritch, 2019). Formal university policies in the United States focus primarily upon a federal mandated policy: The Family Medical Leave Act (FMLA). FMLA requires that organizations with 50 or more employees provide unpaid leave for up to 12 weeks to an employee who must care for his or herself or an immediate family member (Wyatt-Nichol, 2015). Yet this policy, which was originally introduced in 1993, does not take into account the changing family dynamics that both men and women experience today. Today both men and women may have equally shared childcare and household responsibilities. It is ultimately up to the universities and departments to implement and uphold family-friendly policies to create work-life balance in the workplace today (Feeney & Stritch, 2019). Organizations that create a workplace that promotes work-life balance initiatives experience greater performance outcomes (Wyatt-Nichol, 2015) and also have psychological benefits such as increased satisfaction and happiness (Collier, 2016). June (2009) conducted a study of graduate students in doctoral programs at the University of California and found that only 29% of women view research universities as a family-friendly workplace. The increased competitive nature for performance outcomes in a research focused university may limit the opportunity to focus on proper work-life balance initiatives. The strong masculine dominated structuring within research focused universities, may limit the ability of STEM faculty to feel that their departments and universities value that they achieve work-life balance. Therefore, I suggest that:

Hypothesis 1a (H1a): STEM faculty in research focused universities, as compared to teaching focused universities, will report lower levels of work-life balance.

University type: Sense of belonging. A fundamental human motive, the sense of belonging, develops from one's social connections (Pickett, Gardner, & Knowles, 2004; Walton & Cohen, 2017). Sense of belonging reflects the feeling of individual fit as a member in the academic community (Good, Rattan, & Dweck, 2012). Research on sense of belonging in academic settings finds that it is a key predictor in how engaged one is with the academic environment. Success in academia is often based upon academic skillsets and overall performance (Hackett, Betz, & Doty, 1985). The other way to measure sense of belonging is based upon social skills sets, as it is important for academics to interact with their environment and perform required tasks (Winocur & Schoen, 1987; 1988). Research focused universities are considered to be the most prestigious and dominate university type. Faculty working in research focused universities are not only encouraged but are expected to produce high publications, receive large research grants, and push the field of research. Research universities, compared to teaching universities, can place a high degree of pressure on STEM faculty to meet these high-performance metrics which can ultimately lead to issues of inclusivity if they are unable to meet these standards. Sense of belonging reflects a feeling of being happy and comfortable in a domain (Good et al., 2012). The increased pressure to continuously produce high professional outcomes in research focused universities may lead to a decreased sense of belonging. Based upon this, I expect:

Hypothesis 1b (H1b): STEM faculty in research focused universities, as compared to teaching focused universities, will report lower levels of sense of belonging.

University type: Self-efficacy. The term self-efficacy defines the belief that one possesses skills and can use them in a particular situation (Bandura, 1977; 1978). Self-efficacy is considered one of the central mechanisms in human motivation which influences the activities one chooses to do, and the effort put forth (Landino & Owen, 1988). Research on faculty member's self-efficacy finds that as a whole, all faculty members are typically less confident at performing research tasks when compared to teaching tasks due to the level of frequency that faculty must accomplish these tasks (Slaten et al., 2017). Research focused universities engender masculine characteristics where competition and performance measures are high. This masculine culture in research focused universities, when compared to teaching universities, is one potential reason that scholars argue that teaching environments are less likely to offer positive feedback in interpersonal conversations to both faculty and students (Schoen & Winocur, 1988). Based on the underlying expectation that research focused universities are focused less upon supportive environments, I hypothesize the following:

Hypothesis 1c (H1c): STEM faculty in research focused universities, as compared to teaching focused universities, will report lower levels of self-efficacy.

Gender and Psychosocial Outcomes

Today female faculty remain clustered in community colleges and non-doctoral granting universities and therefore they are perceived as less qualified or less serious about academic life (Astin, Anthonio, Cress, & Astin, 1997; Cress & Hart, 2009; Glazer-Raymo, 1999). Faculty in these non-doctoral degree granting universities tend to earn lower salaries, as compared to those at research intensive universities and are thus perceived as less valued (Moss-Racusin et al., 2012). The clustering of women by institutional type such as those non-doctoral granting universities or “teaching” universities, often leads to the perception that women faculty are working in less prestigious universities (Cress & Hart, 2009).

At the most basic level, these accepted gendered distinctions by university type are related to the number of women within each university type. The gendered differences influence the academic career preferences and opportunities for women who complete doctoral studies in STEM disciplines where women are disproportionally represented at higher rates at teaching-focused as compared to research-focused schools (Pinheiro, Melkers, & Newton, 2017; West & Curtis, 2006). These preferences lead to few tenure-track and tenured female STEM faculty in research universities, even with the growing number of women completing PhDs (Krieger et al., 2004; Nelson & Rogers, 2003). Female STEM faculty that are hired in the masculine gendered environment of research institutions experience a disproportionately higher work load assignment. Female faculty are assigned higher teaching course loads and more service responsibilities generally, as compared to male faculty (Bellas & Toutkoushian, 1999; Collins, 1998; Roberts & Ayre, 2002).

Gender: Work-life balance. The ideal worker stereotypes within organizations and in STEM departments hinder female faculty member's ability to achieve work-life balance. In a statement by AAUP in their Statement of Principles on Family Responsibilities and Academic work in 2008 read: *"tenure was historically premised on the married male professor as a universal model and the linear career trajectory in academe assumed that someone else would be taking care of family and domestic responsibilities"* (AAUP, 2008, pg. 260). These gendered stereotypes place female faculty at a disadvantage, especially when the demands of the academic workplace do not take into account the increased at-home responsibilities with those in the workplace as well. Even when department and universities adopt strategies to accommodate female faculty in particular, women are less likely to take advantage of these options due to organizational culture. For example, when departments and universities allowed options to stop the tenure clock, Fothergill & Felty (2003) finds that most female faculty (87%) did not request parental leave, a reduction in teaching loads, nor did they request to stop the tenure clock. Additionally, Frasch et al. (2007) finds that work-life balance across University of California schools report that 51% of female faculty are reluctant to use any of the work-life balance initiatives that are designed towards female faculty members due to negative tenure and promotion decisions it may exhibit in their promotion packets. These work-life balance initiatives may exist, but the underlying organizational culture dictates the use. Therefore, I argue the following:

Hypothesis 2a (H2a): Female STEM faculty, compared to male STEM faculty, will report lower levels of work-life balance.

Gender: Sense of belonging. Research on women in STEM, from K-12 education, practitioners, to academic faculty differences has been a key area of focus. Signals from the environment, such as images in a textbook of men as scientists and engineers to the lack of women represented in the highest position in universities, foster negative perceptions of inclusivity of women in STEM. Generally, across universities female faculty report significantly lower sense of inclusion and belonging in their departments (Falkner et al., 2015). When looking directly at STEM disciplines, women in STEM enter a largely male-dominated fields and can experience high degrees of exclusion across historically elite STEM professional societies (Page, Bailey, Van Delinder, 2009). Women and minorities in STEM experience lower sense of belonging compared to men (Stout et al., 2013). This gendering of STEM disciplines, which is considered masculine, is indicates that STEM departments do not focus on perspectives of comfort, support, and an overall sense of belonging (Rattan et al., 2018). In fact, through the representation of men in many department and university decision making positions women may be more likely to indicate that they do not belong and reaffirms long the lack of support that may exist in these departments. Based upon this, I hypothesize the following:

Hypothesis 2b (H2b): Female STEM faculty, compared to male STEM faculty, will report lower levels of sense of belonging.

Gender: Self-efficacy. Beliefs of one's capabilities in academia can come from one's establishment in the field and from academic output. Yet, this criteria in academia can create issues for STEM female faculty and their self-efficacy. Individual's that are cited the most are those that are high status and established. Men are considered to be cited more often in the fields of STEM as women are often considered to be "low status" and relatively unknown in the field (Merton, 1968). This lack in recognition are social cues to female STEM faculty of their value in the field. While women are found to publish in academic journals with a higher impact factor (van Arensbergen et al., 2012), many studies still find that women on average publish less than men. While publication metrics are a higher priority for research focused universities, many scholars argue that teaching focused universities are also held to similar standards of prestige for university rankings which ultimately place an emphasis on the men who are considered "well-established" (Hartley & Robinson, 1997; Lazaridis, 2010). Performance accomplishments are considered one of the most important aspects of high self-efficacy (Bandura, 1977; 1978). Research on gender differences in STEM finds that women, compared to men, exhibit lower levels of self-efficacy across STEM fields regardless of age, culture, or publication status (Huang, 2013). Because female STEM faculty are exposed to these gendered expectations of performance and establishment through their education and at professional settings, I suggest that they are more likely to perceive their self-efficacy differently. Therefore:

Hypothesis 2c (H2c): Female STEM faculty, compared to male STEM faculty, will report lower levels of self-efficacy.

Social Networks

Individuals in organizations must rely upon networks for psychosocial support. Social network research focuses on the relationships between people rather than those in isolation from one another (Brass, 1995). Social network research notes the individuals that make up the developmental support group are connected to one another through various links (Kim & Kim, 2007). These links between individuals can be from both professional and informal relationships including mentors, colleagues, and friends. Social capital theory states that resources, information, and opportunities are conceived through relationships with other people to achieve a particular end (Coleman, 1988; Bourdieu, 1985). Research on the outcomes of professional and informal relationships focuses primarily upon individual peer mentoring and developmental network research (Kram & Isabella, 1985; Allen, Russell, & Maetzke, 1997). While individuals can gain useful knowledge from mentoring relationships with a particular individual, Higgin and Kram (2001) note that it is more likely that career and psychosocial support will come from a collection of individuals. Building on the mentoring literature and social network research, this study assumes that individuals within a network will seek information and resources from multiple individuals.

Proportion of Women in Networks

Knowledge, information, and support regarding the psychosocial work environment are argued to more likely come from women than men. Employing emotions to achieve organizational mission, willingness to listen, ability to see other sides of an issue, assisting with personal relationships, and nurturing others are commonly attributed as examples of gendered and emotional labor (Ferguson, 1984; Guy & Newman 2004; Meier, Mastracci, & Wilson, 2006; Stivers, 1995; 2002). Outside of the productivity and day-to-day operations within a workplace, women provide more emotional labor or facilitate personal interactions among individuals for better organizational outcomes (Guy & Newman, 2004; Meier, Mastracci, & Wilson, 2006). A majority of studies find that women both provide more emotional labor and are expected to provide the bulk of this support in organizations (Bellas, 1999; Horschild, 1979; 1983; Webb, 2001). Regardless of the organizational settings, whether they are female or male-dominated, women provide the majority of emotional support. Studies of female police officers, a predominately male-dominated setting, finds that women are expected to provide more emotional support for all individuals within the organization (Martin, 1999; Meier & Nicholson-Crotty, 2004). Following previous studies, I argue that emotional labor is more likely to come from women (Bellas, 1999; Guy & Newman, 2004; James, 1989; Martins, 1999; Meier et al., 2006; Webb, 2001). This group composition of women which provide emotional labor and support, can become influential in an individual's network.

Network types

Individuals consciously select their networks, making decisions about the types of people that are included within their networks (Siciliano et al., 2018). STEM faculty may seek out relationships with individuals to attain resources, information, and opportunities to be successful in their careers (Bozeman & Corley, 2004; Feeney & Bernal, 2010; Gaughan et al., 2018; van Rijnsoever et al., 2008). They may also seek relationships to receive psychosocial support. Psychosocial support can come from different types of networks. I investigate the production of psychosocial outcomes from productivity, support, and advice networks. Psychosocial outcomes are influenced by three primary networks of STEM faculty. Overall, based on previous literature that women provide the majority of emotional support, I argue that the proportion of women within these networks will influence STEM faculty's psychosocial outcomes.

There are three primary informal networks for STEM faculty, instrumental and expressive. The first network is the productivity network. Productivity networks are defined as an instrumental network where individuals turn to others for information on collaborations that are focused grant applications, research papers, and course development. STEM faculty are expected to produce performance-based outcomes related to research, teaching, and service. In order to achieve these outcomes, STEM faculty may turn to this specific instrumental network for knowledge and resources that are related to academic productivity. The second informal network for STEM faculty is an expressive network that is categorized as a support networks. Support networks provide STEM faculty with support by reviewing work, introducing collaborators, providing funding, or nominating an individual for an award. Support networks are important for STEM faculty as they work towards achieving professional outcomes such as publications, grant awards, and recognition. The third informal social network for STEM faculty is the expressive network called an advice networks. An advice network provides STEM faculty with input on department and student related issues or concerns. Advice networks are comprised of a set of individuals who can provide both professional and personal advice – for example: advice about departmental politics, personal work-life questions, and advice about student concerns. Advice networks provide information to navigate interactions at the department and university level. Advice networks provide an important resource for STEM faculty to navigate vague work requirements, workplace norms and culture, or unwritten rules. Each of these three informal networks allows STEM faculty to receive information that can both provide professional feedback and can also enhance feelings of personal support.

Proportion of Women: Psychosocial Outcomes

Gender roles in academia and stereotypical gender roles, such as women being nurturing and emotionally supportive, categorize support networks as feminine gendered (Eagly & Karau, 2002). Research on shared social resources amongst women in STEM departments finds that social support from a group of women provides a boost of comfort and sense of belonging within STEM environments (Taylor & Lobel, 1989). Psychosocial outcomes such as work-life balance, sense of belonging, and self-efficacy operate in conjunction with other psychosocial determinants (Caprara, Barbaranelli, Steca, & Malone, 2006; Ismayilova & Klassen, 2019). These outcomes are based upon contextual factors from the work environment such as the people that are closest to them in the workplace (Bandura, 1997; Caprara et al., 2006). When STEM faculty are looking for information upon their personal capabilities this will come from verbal feedback and persuasion received by others which can provide encouragement, ideas for success, and can promote skill development (Ismayilova & Klassen, 2019). Previous research finds that both men and women will turn to women for friendship and for supportive relationships in the workplace (Ibarra, 1992; Xu & Martin, 2011). I suggest that networks with a large proportion of women will provide increased levels of emotional support to STEM faculty.

Women, compared to men, generally place a high value on collegiality and positive interactions in the workplace (Barbezat, 1992; Bernstein et al., 2008). Gendered stereotypes through language and images, expect that women will be warmer and supportive. For example, women are expected to be gentler with their words and exhibit feminine attributes through their clothing or facial expressions such as smiling more. Related to these obvious visual gendered expectations, both men and women expect women to be better confidants. Men and women will often turn to women, as opposed to men, to express emotions in an effort to receive emotional support and understanding (Bellas, 1999; Martin, 1999). As women are expected to provide the majority of emotional support in the workplace, it is likely that a collective group of women can increase psychological and emotionally supportive information and feedback.

Proportion of women: Work-life balance. While family and childcare commitments are not exclusively female focused, women are expected to do the majority amount of household work and childcare (Mason et al., 2012). This gendered expectation provides STEM faculty, both men and women, to be more likely and willing to confide to other women about support or information regarding work-life balance. Work-family commitments are important to both male and female faculty which may lead STEM faculty to assume information about work-life balance may come from networks that have a high proportion of women due to the gendered assumptions of domestic obligations. I therefore, expect that:

Hypothesis 3a (H3a): STEM faculty with a high proportion of women in their informal networks (productivity/ support / advice) will report higher work-life balance.

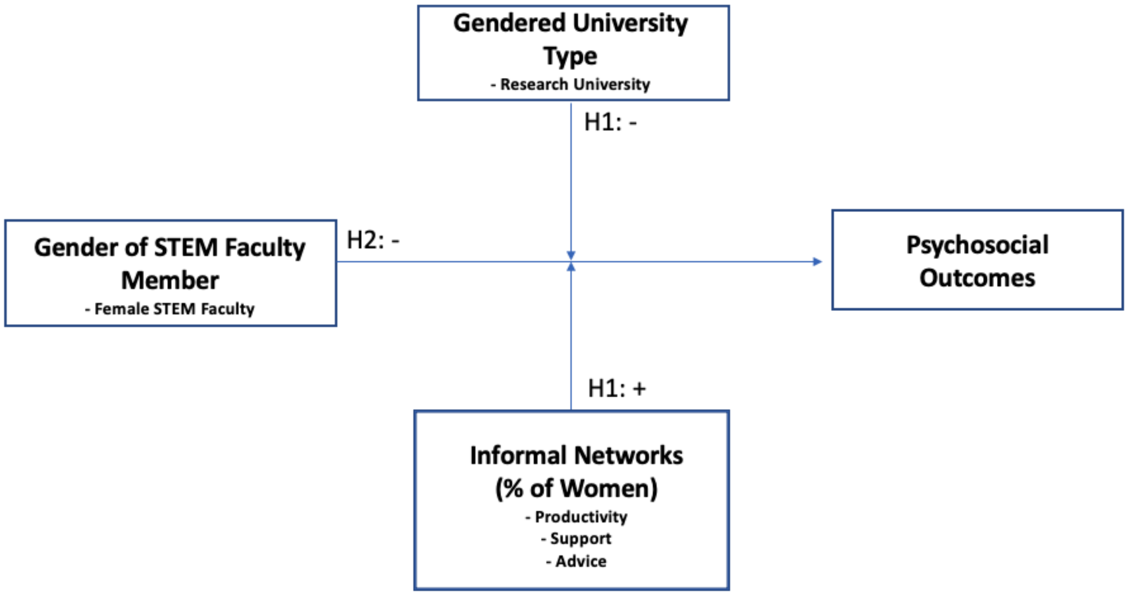
Proportion of women: Sense of belonging and Self-efficacy. Supportive characteristics of women, such as being sympathetic and nurturing, are one of the reasons undergraduate and graduate students turn to female faculty for mentoring (Fox, 2003; Martin, 1993). Outcomes for individuals with social ties to women have mixed findings. Some studies find that social ties to men are more valuable for instrumental reasons while women may be more valuable for developmental reasons (Ibarra, 1992; McPherson & Smith-Lovin, 1986). Previous research finds that female faculty place a higher emphasis on helping colleagues and students with increasing social capacity (Fox, 2003). I suggest that social capacity for STEM faculty is related to sense of belonging and self-efficacy. Assuming that female faculty are more likely to provide emotional support and that they are more willing to provide assistance, then networks with a high proportion of women will provide increased psychosocial outcomes. I therefore, expect that:

Hypothesis 3b (H3b): STEM faculty with a high proportion of women in their informal networks (productivity/ support / advice) will report higher sense of belonging.

Hypothesis 3c (H3c): STEM faculty with a high proportion of women in their informal networks (productivity/ support / advice) will report higher self-efficacy.

This chapter developed hypotheses on the psychosocial outcomes (work-life balance, sense of belonging, self-efficacy) of women STEM faculty by looking at university differences, gendered differences, and the informal network compositions. Overall, the expectation for the psychosocial outcomes for STEM faculty are demonstrated in the empirical model (Figure 2). Network types (e.g. – productivity, support, advice), characterized by gender composition (proportion of women in the network) and gender of STEM faculty predict psychosocial outcomes for STEM faculty. Gendered universities, which rely upon gendered structures of organizations (Acker, 1990; 1992) combined with the network types and proportion of women in those networks will shape the psychosocial outcomes for STEM faculty.

Figure 2. Empirical Model Predicting Psychosocial Outcomes for STEM Faculty



CHAPTER 4

DATA AND METHOD

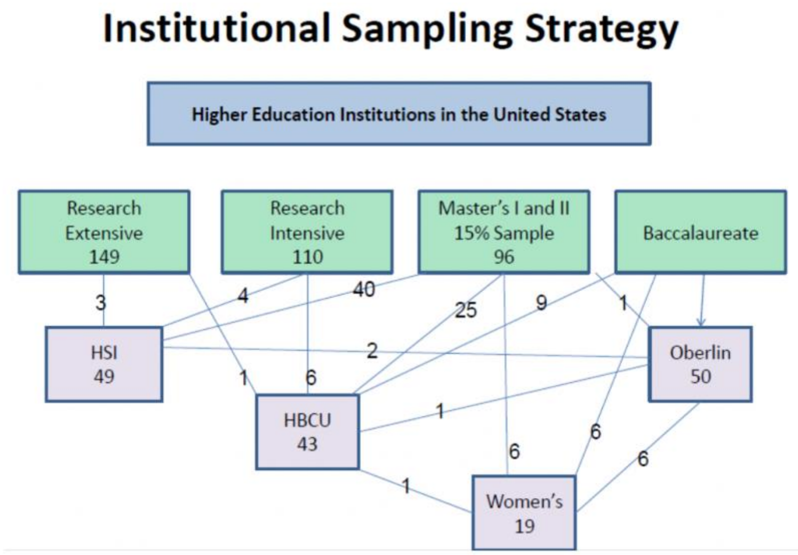
This chapter describes the survey sampling frame, data collection, data sources, variables, and method used in this research. This dissertation uses data from a 2011 National Science Foundation (NSF) funded national survey of academic scientists and engineers: *Women in Science and Engineering II (NETWISE II): Breaking through the Reputational Ceiling: Professional Networks as a Determinant of Advancement, Mobility, and Career Outcomes for Women and Minorities in STEM* (NSF Grant # DRL-0910191). NETWISE II aimed to look at how social and professional networks matter in the careers of STEM faculty, which special attention on women and underrepresented minorities. The academic faculty that make up the sampling frame for this survey are from four types of US higher education institutions: research extensive, research intensive, master's I and II, and baccalaureate, inclusive of Hispanic serving institutions, historically black colleges and universities (HBCU's), women's colleges, and liberal arts colleges. Since the survey was designed with special attention on women, there were four STEM disciplines that were purposefully included for the sampling frame. The four disciplines of biology, biochemistry, civil engineering, and mathematics were selected based on their high, medium and low representation of women in the faculty ranks based off of 2009 National Science Foundation data. The survey was designed to collect information from tenure-track faculty in four STEM disciplines and focused on collecting data on faculty productivity, experiences in the workplace, and their productivity, support, and advice networks.

Sample Development

The NETWISE II sampling frame included academic faculty in four STEM fields across four major higher education institutions (research extensive, research intensive, master's I and II, and baccalaureate). The four STEM fields were selected based upon female representation using the criterion of high (biology and biochemistry), medium (mathematics), and low (civil engineering) producers of women doctorates in each field (NSF, 2015). Following previous research on gender differences by STEM field and based upon NSF data the STEM fields of biology and biochemistry were considered to produce a high number of women doctorate holders, compared to mathematics and civil engineering. The sampling frame included universities that fall within the four major higher education institutions. The research team surveyed the population of research extensive universities, research intensive universities, baccalaureate universities and a 15 percent sample of Master's I and II universities. This included the following universities: research extensive universities (149), all research intensive universities (110; Carnegie Foundation, 2000), HBCU institutions in the White House initiative (forty-three, total across institutional types), all Hispanic- serving institutions (49), all Oberlin liberal arts institutions (50), and women's colleges (19). Figure 3 depicts a visual of the institution-sample that was drawn by the research team.

Figure 3: Higher Education Institutions (NETWISE II Codebook, pg 9, 2009)

Population Database



The research team drew a random sample of 10,499 from the sampling frame of 26,435 higher education institutions in the United States. The research team then manually retrieved faculty contact information from online directories, department websites, and faculty webpages for the four STEM departments for each university in the random sample. This information was used to create a population database (n=26,435). Included in this population database are all academic faculty in biology, biochemistry, civil engineering, and mathematics that are tenure-track faculty. During the development of the sampling list, student workers identified faculty member's sex by name, photo, individual webpages, and news articles using gendered pronouns. The research team purposefully oversampled women and minorities for the sampling procedure to ensure that there was a broad range of faculty by university type, to obtain an adequate number of women for gender-based comparison, and to obtain an adequate number of underrepresented faculty for race and ethnicity-based comparison. These data were verified by the principal investigators. There was a stratified sample of 9,925 out of 25,298 academic faculty members across 521 universities in the United States for the final sample. The sampling frame of 25,298 faculty was partitioned into a sampling grid of 112 cells in which each distinct institution, field, gender and race combination was represented. 83 were sampled with certainty (p=1.0), with 29 cells being sampled at n =200 with proportion ranging from 0.053 (white male civil engineers in research extensive universities) to 0.97 (white male biologists in liberal arts institutions). The combination of selection-with-certainty and proportional-to-size results in the final sample 9,925 (38% of the original sampling frame).

Survey Administration

Faculty members were invited to participate in the survey through a personalized e-mailed letter, which included a personal username, personal and unique password, and an online link to the survey. To boost the final response rate two personal reminder e-mails were sent to all participants encouraging them to complete the survey. It took faculty members thirty to forty-five minutes to complete the online survey. The participants were sent a survey through their university e-mail addresses, which were verified through a ping program to ensure correct e-mail address of the individual. The survey was administered through an online survey system, Sawtooth Software™.

Survey Data

The NETWISE II survey collected data on individual background, career path, productivity, research, teaching activities, service activities, job experience, professional activities, information on institutional environment, and network data. The use of the Sawtooth Software™ allows for detailed information about the respondent (ego) and individuals that they indicate they have a relationship of some sort with (alter). This is captured in the software by creating name-generator and name-interpreter questions. In doing this, respondents were able to name alters (name-generator) that fit a type of role (i.e. – mentor, collaborator, received advice etc.) and then these names would be inputted within name-interpreter questions that would then ask specific questions about the alter member (i.e. – gender, how they met, resources received, etc). This follows the common approach in social network analysis which allows insight into both individual-level and network-level data (Burt & Minor, 1983; Straits, 2000; Marin & Wellman, 2011). Following previous network survey design literature (Marsden, 2006), respondents were limited to name up to five individuals for each name generator question. The use of this software also ensured that there were no-duplicate names listed from the name-generator questions that identified alters for the ego and allowed the names to be piped into the name-interpreter questions to describe the alters. The network data in this survey focuses on the ego-centric network data, where the respondent (the ego) answered questions about their particular network members (alters). Using ego-centric network data allows faculty members to identify mentors, professional connections, and student networks. In particular, respondents named colleagues in similar universities and disciplines, named collaborators and advisors in similar institutions, other disciplines, industry, and government. Respondents were asked to input the names of individuals that fit within certain categories such as research collaborators or teaching advisors. Once a name was inputted, the name would be piped into later questions that asked respondents to describe the origin of the relationship, the level of relationship closeness, and frequency of communication with the named individual. Respondents (the ego), would name up to five individuals whom they identified as a network member (alter) to a particular category (collaborator, mentor, colleague, etc.). From the names that were listed from the name-generator, they were then piped in as name-interpreter questions asking about specific information about alters such as (i.e. – length of relationship, friend, etc.). Respondents were asked to provide network ego-centric data regarding the nature of their relationships with the five individuals that they identified such as information on where the alter works, how they met, the resources received from the alter, if the alters know the other alters that the respondent identified, and finally various demographic characteristics (i.e. – gender).

The final sample after removing bad email addresses from the ping was 9,925, there were a total of 4,313 completed and partially completed surveys. 117 of the surveys were removed because of ineligibilities due to rank or discipline. A final total response sample was 4,196: 3,561 completed surveys and 639 partial completions. The overall response rate was 40.4% (AAPOR, 2009). Table 1 provides the overall distribution of survey responses.

Table 1. NETWISE II Distribution of Survey Responses

Removed cases	117
Number of explicit refusals	339
Number of no response	5,551
Number of unreachable respondents	295
Number of selected respondents outside of sample	116

Number of ineligibles	114
Final sample	4,196
Number of complete responses	3,560
Number of partial responses	636

Bibliometric Data

The research team collected publication data from the Web of Science. The research team used the name and institution information from the CVs that were either submitted by the respondent or the research team collected to conduct a refined search in the Web of Science to collect the number of articles published by each respondent. The Web of Science provides a comprehensive citation database for researchers, by academic discipline. The research team collected the number of articles in the Science citation index that a respondent had published by following strict criteria to ensure accuracy. For a detailed step-by-step protocol used to obtain publications from the Web of Science and the criteria used for accuracy can be found in Appendix A. The research team combined the bibliometric data with responses to the NETWISE II survey instrument.

Integrated Postsecondary Education Data System Data

I used data from Integrated Postsecondary Education Data System (IPEDS) to collect university characteristic information. These data come from the National Center for Education Statistics (NCES), a federal entity that collects and analyzes data for education in the U.S. I combine two variables from IPEDS to the NETWISE II final sample: (1) tenure-track underrepresented minority full-time faculty in the university and (2) total number of tenure-track full-time faculty in the university.

Final Sample

This study is interested in the gender composition of networks and uses data from a total number of 3,012 NETWISE II survey respondents. Due to the oversampling of women and underrepresented minorities, all data analysis is conducted with weights. Weights are calculated as the inverse of the probability of inclusion in the study, which varied by gender, race, ethnicity, and university type. The distribution of STEM faculty in the sample is presented in Table 2. In the final sample, academic women STEM faculty in research institutions comprises 48.17% (1,451 out of 3,012).

Table 2. Distribution of STEM faculty in study sample

	Final Sample (N = 3,012)	
	Number	%
Women	1,317	43.73%
Research Institutions	1,451	48.17%
Teaching Institutions	1,561	51.83%
Assistant Professor	762	25.30%
Associate Professor	1,042	34.59%
Full Professor	1,199	39.81%
Biochemistry	551	18.29%
Biology	1,085	36.02%
Civil Engineering	561	18.63%
Mathematics	815	27.06%

Measurement

This section describes the measures that will be used for the models presented in Chapter 5. See the Appendix B for the list of all the questionnaire items use in this study.

Dependent Variables.

Psychosocial outcomes. I use three dependent variables to measure psychosocial outcomes: *work-life balance, sense of belonging, and self-efficacy*. These measures from the NETWISE II survey and have response categories that are likert agreement scales ranging from 1 = "Strongly disagree" to 4 = "Strongly agree". The final variables are average scales of the *work-life balance, sense of belonging, and self-efficacy.*

Work-life balance is measured by five questionnaire items, from Netemeyer et al. (1996), that ask individuals if:

- *The demands of my work interfere with my home and family life*
- *The amount of time my job takes up makes it difficult to fulfill family responsibilities*
- *Things I want to do at home do not get done because of the demands my job puts on me*
- *My job produces strain that makes it difficult to fulfill family duties*
- *Due to work-related duties, I have to make changes to my plans for family activities*

I reverse coded the *work-life balance* items to ensure that the likert item agreement scale was signifying that the respondents were indicating that they are indicating satisfaction with items as opposed to negative perspectives of the measure. The responses for this measure ranged from one to four with a mean of 2.32. *Work-life balance* has a Cronbach's alpha of 0.928.

Sense of belonging is measured with eight questionnaire items that indicated that faculty:

- *Faculty care about each other*

- *Faculty treat each other with respect*
- *Faculty know each other well*
- *Faculty don't really know much about each other's research projects (REVERSE)*
- *Faculty have little contact with each other (REVERSE)*
- *Faculty compete for departmental resources (REVERSE)*
- *Faculty are accessible to each other*
- *Faculty put their own interests first (REVERSE)*

Sense of belonging is based on eight questionnaire items, which included common psychometric items focused on organizational self-esteem and organizational commitment at the individual level (Pierce, Gardner, Cummings, & Dunham, 1989), that focus on perspectives of faculty's views of their fit with their department. This measure ranges from one to four with a mean of 2.66 and has a Cronbach's alpha of 0.871

Self-efficacy is a combination of responses to ten psychological questionnaire items from the International Personality Item Pool (IPIP) developed by Boyle, Matthews, & Saklofske (2008). Respondents were asked to indicate their level of agreement or disagreement with the following items:

- *I have a natural talent for influencing people*
- *I take charge*
- *I see myself as a good leader*
- *I can talk others into doing things*

- *I am good at making impromptu speeches*
- *I don't like to draw attention to myself (REVERSE)*
- *I lack the talent for influencing people (REVERSE)*
- *I keep in the background (REVERSE)*
- *I find it difficult to manipulate others (REVERSE)*
- *I have little to say (REVERSE)*

This measure for this a scale average from one to four. A scale average closer to one indicates lower beliefs of self-efficacy and a scale average closer to four indicates higher levels of self-efficacy. The mean for self-efficacy is 2.68, with a Cronbach's alpha of 0.831.

For justification in using the three measures of the dependent variable, psychosocial outcomes, I conducted factor analysis with a varimax rotation to ensure that the measures for psychosocial outcomes are capturing distinct concepts. The summary of the factor analysis using principal component extraction with the rotated component matrix is in Table 3. The factor analysis loads on three factors: *work-life balance, department culture, and self-efficacy.*

Table 3. Exploratory Factor Analysis for Psychosocial Variables

Variables	**Components**		
	Work-life balance	**Sense of belonging**	**Self-efficacy**
Demands at work interfere with my home and family life	**0.87**	0.07	0.00
Amount of time my job takes makes it difficult to fulfill family responsibilities	**0.90**	0.10	0.04

Things I want to get done at home do not get done because of job demands	**0.82**	0.05	0.02
My job produces strain that makes it difficult to fulfill family duties	**0.88**	0.14	0.05
Due to work-related duties, I have to make changes to my plans for family activities	**0.75**	0.09	0.00
Faculty care about each other	0.00	**0.83**	0.08
Faculty treat each other with respect	0.02	**0.78**	0.04
Faculty know each other well	0.04	**0.73**	0.08
Faculty don’t really know much about each other's research projects (REVERSED)	0.08	**0.47**	0.02
Faculty have little contact with each other (REVERSED)	0.06	**0.71**	0.04
Faculty compete for departmental resources (REVERSED)	0.14	**0.54**	0.01
Faculty are accessible to each other	0.03	**0.68**	0.06
Faculty put their own interests first (REVERSED)	0.07	**0.66**	0.02
I have a natural talent for influencing people	0.03	0.03	**0.75**
I take charge	-0.03	-0.04	**0.64**
I see myself as a good leader	0.01	0.00	**0.66**
I can talk others into doing things	0.03	0.00	**0.65**
I am good at making impromptu speeches	0.00	0.02	**0.51**
I don't like to draw attention to myself (REVERSED)	0.04	0.00	**0.37**
I lack the talent to influence people (REVERSED)	0.08	0.07	**0.65**
I keep in the background (REVERSED)	0.06	0.00	**0.62**
I find it difficult to manipulate others (REVERSED)	0.01	0.04	**0.35**
I have little to say (REVERSED)	0.07	-0.02	**0.54**
Eigenvalues	**3.82**	**3.64**	**3.78**
% Variance	0.17	0.16	0.15

Rotation: Varimax

Independent Variables.

There are three primary independent variables of interest: university type, respondent gender, and gendered composition of informal department. This study is primarily interested on women’s representation in networks to capture informal emotional support in networks, therefore only the percentage of women across ego-centric network types within their department for both male and female faculty members are of focus for this study. I describe the main variables of interest in this study and the construction of the informal networks below.

Faculty gender. Respondents were asked to indicate their biological sex as either man or woman. This study is interested in how STEM faculty perceive their psychosocial outcomes. *Women* (=1) indicates the STEM faculty member's sex.

University Type. Research focused university is a binary variable indicating if the university is research extensive or intensive (=1) or a teaching focus university is categorized as teacher-centric to include Historically Black Colleges and Universities, Hispanic Serving Institutions, Women's Colleges, Master's I/II or liberal arts colleges (=0). The variable is based on the 2000 Carnegie Classification system. Of the 3,012 respondents, 1,451 work at research-focused universities and 1,561 work at teaching-focused universities.

Networks. I focus on three informal networks: productivity, advice, and support networks. Prior research demonstrates that unit membership or proximity within social structures (Brass, 1985; Ibarra & Andrews, 1993; Marsden & Friedkin, 1993) plays a critical role for informal relationships and the composition of workgroups. The informal network variables for this study come from the name-generator and name-interpreter questions in the survey. Respondents identified individuals (name-generator) in their productivity, support, and advice networks. They then answered a set of questions (name-interpreter) about those individuals. We asked respondents to indicate the gender/sex of each person in their productivity, support, and advice network. Respondents were asked three separate questions to identify individuals in their productivity, advice, and support networks (alters), based on who they collaborated with, who they seek advice from, and who provides them support, respectively.

The productivity network is defined by individuals in the network who engage in collaborative research papers, course development, and research and teaching grants (Siciliano et al., 2018; Welch & Ja, 2016). To identify the respondent's productivity network, the respondents were asked to indicate the types of collaborations they had with each person they named. The questionnaire asked:

"*What types of collaborations have you had with the following individuals over the past two academic years?"*

- *Research grant proposal*
- *Teaching or curriculum grant proposal*
- *Public one or more articles together*
- *Co-developed curriculum or course*
- *Co-taught a course together*

The productivity network is the sum of named individuals within the respondent's department from whom respondents collaborate with for productivity outputs. The average productivity network size is 3.64, with a range of 0 to 20, weighted.

I construct the advice and support network structures by following previous literature on the support and advice networks provided to STEM faculty by their networks (Feeney & Bernal, 2010; Gaughan, et al., 2018; Welch & Ja, 2016). Advice networks were captured with the following questionnaire item:

"What advice do you typically seek from the following individuals?"

- *departmental politics*
- *student related issues*
- *interactions with colleagues*
- *work/family balance*

I create a sum of named individuals from whom respondents seek or receive advice from to create the advice network. The average advice network size is 4.65, with a range of 0 to 25, weighted.

Support networks capture support with aspects related to career development. The questionnaire asks,

"Please indicate if the people you named have…

- *reviewed your papers or proposal prior to submission*
- *introduced you to potential research collaborators*
- *invited you to join a grant proposal team*
- *nominated you for an award*
- *recommended you as an invited speaker/panel member*
- *provided you with research or other funding*

Following the similar process as the productivity and advice networks, I take the sum of named individuals from the respondent to create the support network. Support network sizes range from 0 to 21 with the average support network size at 4.51, weighted.

Since this study is interested in the relationships between gendered networks and psychosocial outcomes, I created measures indicating the proportion of women of women within each type of network (productivity, advice, and support). Following research on demographic composition, when interested at the group-level for how gender differences within groups for female-dominated groups are distinct the appropriate way to measure this is by using the proportion of women to look at gender composition (Williams & Mean, 2004). I call these three ego-centric variables: *proportion of women in productivity network, proportion of women in advice network, and proportion of women in support network.* Below I describe the construction of the three variables.

Construction of Proportion of Women in Informal Networks.

As mentioned earlier, the respondent network data (alters), contain information about the members in the respondent's network including demographic information (e.g. female) and information about the interactions between the respondent (ego) and the members of the network (alters). I first calculated the number of people in each respondent's respective network (e.g. productivity, advice, and support). Drawing from the demographic information for network members (alters), I divide the number of women in each network by the sum the number of individuals in the network. For example, if a respondent lists four individuals within their advice network in their department and one of those four individuals is a woman, the proportion of women in their advice network is 0.25. The resulting variable is a ratio of women in each informal network type. Table 4 provides the summary statistics for the three independent variables *proportion of women in productivity network, proportion of women in advice network, and proportion of women in support network*.

Table 4. Summary Statistics for Proportion of Women by Network in the Department, Weighted

	N	Mean	Std. Dev.	Min	Max
% Women in Productivity Networks	3,012	0.84	0.33	0	1.00
% Women in Advice Networks	3,012	0.84	0.32	0	1.00
% Women in Support Networks	3,012	0.89	0.27	0	1.00

Control variables.

Several factors may influence psychosocial outcomes of STEM faculty. I include control variables that can be categorized as respondent controls, network, department and university controls. Respondent controls include items from the NETWISE II survey and the number of publications from the bibliometric data. These respondent controls include information on the respondent's STEM department, academic rank, family status and responsibilities, publications, grant awards, course load, tenure clock changes, and salary. Network controls include information regarding the aggregated information about the alters in the respondent's network. The network controls include information on network size, network density, strength of network ties, friendship ties, respondent ties to women in the department, and respondent ties to senior female faculty in their department. At the department level, I control for the proportion of female professors in the department, the proportion of female full professors in the department, and faculty department size. These department level control variables come from the sampling frame data collected by the research team. At the university level, I control for the total number of tenure-track underrepresented minorities in the university and the total number of tenure-track faculty in the university. University level controls come from the 2011 IPEDS data on the university characteristics. I describe each of the controls below.

STEM department. Women are disproportionately represented across academic fields (Carrigan et al., 2011; Fox, 2010), which may affect the proportion of women available in teaching, research, and support networks (Feeney and Bernal, 2010) and the probability of successful work outcomes. The disproportional gender representation of women across fields is even more prevalent across STEM departments. Women are more likely to be attracted to fields such as biology and chemistry compared to engineering and physics (Cheryan et al., 2015; Hughes, 2002). I control for this potential variation with four dummy variables: Biochemistry (=1), Biology (= 1), Civil Engineering (= 1), Mathematics (= 1).

Academic rank. Academic rank is related to women's representation, productivity and psychosocial outcomes. Women are more likely to be in lower ranks in the academy (Fox, 1995) and women at higher ranks report higher levels of research productivity (Sax, Hagedorn, Arredondo, & Dicrisi, 2001). Three dummy variables indicate academic rank: Assistant professor (= 1) (all else =0), Associate professor (= 1) (all else =0), and Full professor (= 1) (all else=0).

Marriage-like relationship. Women's work outcomes are significantly related to marital status and caring for dependents (Riffle et al., 2013; Sax et al., 2002) making it important to control for these factors in models predicting work outcomes. Respondents were asked to indicate from a categorical variable if they were currently: 1) married 2) living in a marriage-like relationship 3) widowed 4) divorced 5) separated 6) single. I then created the *Marriage-like relationships* by developing a binary variable where respondents that are married or living in a marriage-like relationship are coded as 1, all others are coded as 0.

Changing the tenure clock. Faculty who take parental or sick leave often qualify for a temporary stop or extension of the tenure clock (Drago & Williams, 2000; Lisa & Wolf-Wendel, 2005). Temporarily resetting the tenure clock has mixed professional and department environment outcomes (Lisa & Wolf-Wenden, 2005). The measure *changing the tenure clock* is a binary measure indicating if the tenure clock has been extended, paused or reset (yes=1) or not (=0).

Dependent Care. The variable *dependent care* measures if faculty since they started positions at their university have or are providing care to dependents such as children, parents, or relatives. Dependent care is a binary variable coded 1 if the respondent cared for dependent children, an aging parent or relative while on faculty, 0 if not.

Underrepresented Minority. The NSF identifies that minority group members that are Native American, African American, and Hispanic have historically lower rates of representation in STEM fields (NSF, 2011). *Underrepresented Minority (URM)* is a binary variable coded 1 if the respondent identified as Native American / African American / Hispanic, and 0 if not.

Research and Teaching Measures. There are four research and teaching measures. *Publications* is a variable constructed from bibliometric data collected from the Web of Science for each respondent from the year they received their PhD to 2011. Three measures come from the NETWISE II survey which asked respondents questions about course loads, teaching grants, and research grants. *Course load* is an open-ended question asking respondents the number of courses taught over the past two years. It ranges from 4 to 100. T*eaching grants* is an open-ended question asking respondents to indicate the total number of teaching grants submitted over the past two years. *Research grants* is an open-ended question asking respondents to indicate the total number of research grants submitted in the last two years.

Salary. Women's low presence and lower job outcomes such as tenure and promotion are argued to be a result of lower salary than men (Summers, 2005; Xu, 2002), making salary an important control. The variable *Salary* is a continuous variable. Respondents were asked to enter their approximate current annual salary (excluding summer appointments). Salary ranges from $45,000 to $200,000. The average salary for female respondents was $81,470 The average for men in the respondent group is $87,528. For the OLS models, I use the logarithm of *Salary*, as it is more normally distributed.

Network Controls.

Network Size. Research on network structures demonstrate that network size predicts productivity for scientists (Siciliano, Welch, & Feeney, 2018; Ynalvez & Shrum, 2011), making it important to control for the network size. Network size refers to the total number of people listed in the network (Wasserman & Faust, 1994). Respondents were asked to name up to 5 individuals in 5 networks, for a possible total of 25. Following social network research, respondents are limited to naming up to five individuals in their network as these are considered to core personal networks (Hammer, 1983; Straits, 2000). These core personal networks are considered to be influential to the ego's attitude and behavior (McCallister & Fischer, 1978). *Network size* is the sum of individuals the respondent named in their productivity, advice, and support, it ranges from 0 to 25.

Friendship ties. Friendship ties can be a combination of the amount of time and emotional intensity of the relationships within a network (Granovetter, 1973). The exchange of information and resources amongst network members can be based upon the degree of emotional tie or friendship between individuals. *Friendship* within networks can indicate a higher level of emotional connection and trust (Etzkowitz et al., 2000; Feeney & Bernal, 2010; Krackhardt, 1992; Parker & Welch, 2013) and can potentially lead to better productivity outcomes. Understanding that the friendship tie between individuals can influence the strength of ties, I control for this variation. I use the questionnaire items that asks respondents to indicate if each network member is "a close friend" =1. I calculated the ratio of close friends across all the networks for women STEM faculty.

Length of relationship. *Length of Relationship* indicates how long an individual has known a network tie (alter); longer duration indicates stronger ties. Duration of relationship is a categorical variable that is coded as: 1 = less than two years, 2= 2-5 years, and 3 = more than 5 years. To calculate the average length of relationship I took all the relationships that the respondent reported and averaged the duration of the relationships.

Department Network Density. Network density refers to how densely connected alters in the network are compared to the total number of possible connected alters there could be in a network. Dense networks allow greater access to social capital such as information about department culture and scientific products through greater connectivity with groups (Bourdieu, 1986, Siciliano et al., 2018). The degree of network density, from low to high density, can impact the exchange of knowledge and thus is an important control to capture this variation. *Department Network density* is measured by the ratio of the number of ties among the alters in the department network (how connected they are) divided by the total number of ties that could exist among the alters.

Female Department Ties and Senior Female Department Ties. *Female Department Ties* is a continuous variable ranging from 0 – 7 that indicates the number of female ties for the respondent that are within their department. *Senior Female Department Ties* is a continuous variable ranging from 0 - 9 that measures if the respondent has ties to any senior women in the department.

Department and University Controls

Faculty Department Size across STEM sample. Faculty department size across the STEM sample is a continuous measure from one to 41 that indicates the number of individuals within the departments in the sample. This measure comes from the information obtained by the research team on the department size across each university in the sample.

Proportion of Women in the Department. The research team collected data on the number of individuals in each department in the sample and coded the number of male and female faculty in each department. This is a continuous variable from 0.00 to 1.00 indicating the proportion of women in each respondents' department. This was created by taking the number of female faculty divided by total number of faculty in the department.

Proportion of Female Full Professors in the Department. The research team collected information on the rank of faculty within the university departments in the sample. This is a continuous variable from 0.00 to 1.00 that indicates the proportion of full professors that are female within the department. The variable was created by dividing the total number of female full professors over the total number of faculty in the department.

Total Tenure-Track Underrepresented Minorities in the University. Total tenure-track underrepresented minorities in the university is a continuous variable from 0 – 416 that indicates the number of tenure-track or tenured faculty that identify as underrepresented minorities (e.g. - Native Americans/African Americans/Hispanics). These data come from the IPEDS data. I use the natural log of total tenure-track underrepresented minorities to normality of the measure in the models. The average number of tenure-track underrepresented minorities in the university is 55. The variable *Log(Total Tenure-Track URM in the University)* ranges from 0.00 to 6.03 with a standard deviation of 0.92, weighted.

Total Tenure-Track Faculty in the University. Total tenure-track faculty in the university is a continuous measure from 11 to 2,766 indicating the number of tenure-track and tenured faculty members across all the universities in the sample. The data come from IPEDS. The average number of tenure-track faculty by university is 555. To analyze this measure in my models I use a natural log of this measure to ensure normality of the measure. *Log(Total Tenure-Track Faculty in the University)* ranges from 2.40 to 7.93 with a standard deviation of 0.83, weighted.

Descriptive statistics with weights are reported in table 5.

Table 5. Descriptive Statistics, Weighted

	Obs.	**Mean**	**St. Dev.**	**Min**	**Max**
Dependent Variables					
Work-life balance	2,941	2.32	0.72	1	4
Sense of belonging	2,900	2.66	0.50	1	4
Self-efficacy	2,724	2.68	0.41	1	4
Ego-Centric Variables					
Women	3,012	0.29	0.45	0	1
Research Universities	3,012	0.68	0.47	0	1
% Women in Productivity Networks	3,012	0.84	0.33	0	1
% Women in Advice Networks	3,012	0.84	0.32	0	1
% Women in Support Networks	3,012	0.89	0.27	0	1
Controls					
Ego-centric Controls					
Biochemistry	3,012	0.11	0.31	0	1
Biology	3,012	0.42	0.49	0	1
Civil Engineering	3,012	0.16	0.37	0	1
Mathematics	3,012	0.31	0.46	0	1
Assistant Professor	3,003	0.21	0.41	0	1
Associate Professor	3,003	0.32	0.47	0	1
Full Professor	3,003	0.47	0.50	0	1
Married / Marriage-Like Relationship	3,003	0.86	0.34	0	1
Tenure Clock Change	3,012	0.10	0.30	0	1
Dependent Care	3,012	0.63	0.48	0	1
Underrepresented Minority	2,995	0.09	0.29	0	1
Publications	2,323	35.38	41.72	1	809
Research Grant Average	2,569	1.73	2.44	0	50
Teaching Grant Average	2,342	0.55	1.46	0	40
Teaching Course Load Average	2,978	53.82	11.75	4	100
Salary ($)	3,012	90,361	29,203	45,000	200,000
Network Controls					
Network Size	3,012	9.07	4.02	1	26
Friendship Ties	3,012	2.85	2.86	0	19
Length of Relationship	2,892	2.69	0.31	1	3

Department Network Density	3,012	0.37	0.19	0	1
Senior Female Department Ties	3,012	0.25	0.58	0	5
Department Female Ties	3,012	0.76	0.96	0	7
Department and University Controls					
% Women in Department	2,927	0.39	0.21	0	1
% Women Full Professors in University	2,927	0.11	0.13	0	1
Department Size	2,927	9.37	6.00	1	41
Tenure-Track Underrepresented Minorities in University	3,008	62.63	52.35	0	416
Tenure-Track Total Faculty in University	3,008	756.79	536.33	11	2,766

Method

This next section discussion the method, model fit, multicollinearity, and the model estimation. The analysis for this study focuses on three outcome variables that measure perceptions of psychosocial outcomes for STEM faculty: work-life balance, sense of belonging, and self-efficacy. Each dependent variable (DV) comes from the NETWISE II survey on STEM faculty's self-reports of psychosocial outcomes and are likert-scale questions with level of agreement or disagreement response categories. I take the scale averages for my three dependent variables of work-life balance, sense of belonging, and self-efficacy (Johnson & Creech, 1983; Norman, 2010; Sullivan & Artino, 2013; Zumbo & Zimmerman, 1993). As mentioned earlier in the chapter, the survey items used to capture the three dependent variables load on three separate factors with Cronbach alpha correlations above 0.70. I use ordinary least squares (OLS) regression models to predict the dependent variables with clustered robust standard errors at the department level.

The use of an OLS regression model relies on ensuring that a number of assumptions must be met concerning the data and the study (Kachigan, 1991; Lewis-Beck & Lewis-Beck, 2016). Each model in this study adheres to the criteria of the expected value of the error term being equal to zero. I use clustered robust standard errors, as the STEM faculty in this study are nested within departments and universities. The use of clustered robust standard errors also adjusts for heteroscedasticity issues to ensure that the assumption of homoscedasticity is met. Two of the three dependent variables, sense of belonging and self-efficacy, are normally distributed. This third variable, work-life balance, is not normally distributed. I transformed the work-life balance dependent variable into a z-score to achieve normal distribution. I ran the models predicting work-life balance with the non-transformed dependent variable and the z-scores. The results in the non-transformed models and z-score models for work-life balance do not differ. To ease comparison in the results across the three models, I use the non-transformed models, enabling clear interpretation across the three models. The z-score models for work-life balance can be found in the Appendix C. Prior to estimating my three models, I checked for multicollinearity issues.

Multicollinearity occurs when explanatory variables are highly correlated (Agresti & Finlay, 2009). High multicollinearity creates estimation problems because it produces large variance for the slop estimates which leads to inflated standard errors (Lewis-Beck & Lewis-Beck, 2000). The bivariate correlation table in the Appendix D, which indicates that they are not highly correlated as all coefficients are below the 0.8 expectation (Lewis-Beck & Lewis-Beck, 2000). While bivariate correlation tables are a common practice to check for high correlation, the preferred method of assessing multicollinearity is using the Variance Inflation Factor (VIF).

The Variance Inflation Factor (VIF) is used to check for multicollinearity by measuring how much variance of the regression coefficients is inflated compared with the noninflated baseline of linearly independent predictors (Lewis-Beck & Lewis-Beck, pg. 79, 2000). A rule of thumb for researchers is that VIF greater than ten indicates high multicollinearity issues and must investigated further (Agresti & Finlay, 2009; Lewis-Beck & Lewis-Beck, 2000). Results for the multicollinearity analysis for each model is reported in table 1. As indicated in table 6, none of the models are above the VIF>10 threshold, which indicates that there are no multicollinearity issues.

Table 6. VIF estimation for the models

	Work-life balance	Sense of Belonging	Self-Efficacy
	VIF	VIF	VIF
Women	1.29	1.29	1.29
Research University	1.81	1.81	1.80
% of Women in Productivity Network	1.16	1.16	1.17
% of Women in Support Network	1.16	1.15	1.17
% of Women in Advice Network	1.08	1.07	1.10
% of Women in Department	1.48	1.48	1.50
% of Female Full Professors	1.41	1.41	1.41
Department Size	1.32	1.33	1.33
Biochemistry	1.65	1.65	1.68
Biology	1.99	2.01	2.06
Civil Engineering	2.04	2.05	2.10
Assistant Professor	3.25	3.26	3.23
Associate Professor	1.97	1.96	1.99
Marriage-like Relationship	1.08	1.08	1.08
Tenure Clock Change	1.18	1.18	1.18
Dependent Care	1.08	1.08	1.08
Underrepresented Minority	1.16	1.15	1.16
log(Salary)	2.44	2.41	2.38
log(bibliometric publications)	2.07	2.04	2.11

log(Average Teaching Grants)	1.13	1.12	1.13
log(Average Research Grants)	1.71	1.69	1.70
log(Average Course Load)	1.15	1.15	1.15
Friend Ties in Department	1.61	1.62	1.65
Length of Relationship	1.89	1.89	1.89
Department Network Density	1.26	1.25	1.25
Female Department Network Density	1.49	1.49	1.49
Network Size	1.77	1.76	1.77
Department Female Senior Ties	1.65	1.65	1.64
Tenure Track URM Faculty in University	3.12	3.08	3.14
Tenure Track Faculty in University	3.77	3.73	3.83
	N = 1,442	N = 1,442	N = 1,356

Estimation and Regression Model.

The OLS estimation equation for the psychosocial outcomes (work-life balance, sense of belonging, and self-efficacy) in this study is the following:

(1) $\boldsymbol{Psych}_i = \beta_0 + \beta_1 UniversityType_i + \beta_2 Women_i +$

$\beta_3 \%WomenProductivityNetwork_i + \beta_4 \%WomenSupportNetwork_i +$

$\beta_5 \%WomenAdviceNetwork_i + \beta_6 \%WomenDepartment_i +$

$\beta_7 \%WomenFullProfessorsUniversity_i + \beta_8 FacultyDepartmentSize_i +$

$\beta_9 Biochemistry_i + \beta_{10} Biology_i + \beta_{11} CivilEngineering_i +$

$\beta_{12} AssistantProfessor_i + \beta_{13} AssociateProfessor_i +$

$\beta_{14} MarriageLikeRelationship_i + \beta_{15} TenureClockChange_i +$

$\beta_{16} DependentCare_i + \beta_{17} UnderrepresentedMinority_i +$

$\beta_{18} \log{(Salary)}_i + \beta_{19} \log{(BibliometricPublications)}_i +$

$\beta_{20} \log{(\#AvgTeachingGrants)}_i + \beta_{21} (\#AvgResearchGrants)_i +$

$\beta_{22} Friends_i + \beta_{23} LengthRelationship_i +$

$\beta_{24} DepartmentNetworkDensity_i +$

$$\beta_{25}FemaleDepartmentNetworkDensity_i + \beta_{26}NetworkSize_i +$$

$$\beta_{27}SeniorFemaleFacultyDepartmentTies_i +$$

$$\beta_{28}TenureTrackURMFacultyUniversity_i +$$

$$\beta_{29}TenureTrackUniversityFaculty_i + \varepsilon_i.$$

This section introduced the estimation model for my three dependent variables and provided an overview on the model fit. The next chapter will discuss respondent sample descriptives and the results.

CHAPTER 5

RESULTS

This chapter discusses respondent sample descriptives and results of this study, which investigates variation of psychosocial outcomes based on the gender composition of informal network types across university type, by respondent sex. This chapter is divided into two sections. The first section presents the respondent sample description. The next section discusses the results including statistical interpretation of the coefficients and hypotheses testing.

Respondent Sample on the Distribution of Women by Network Type Descriptive.

To better understand STEM faculty ties to women in networks, the survey asked respondents to indicate how many female ties each respondent has. Respondents in this study could list up to 25 people within their productivity, advice, and support networks. Table 7 indicates the summary statistics of female department ties across each network type, indicating the number of female department network ties across productivity, advice, and support networks. Across the sample respondents indicate that they have 0 to 21 female ties depending on the network type. Men and women in the sample indicate on average fewer female ties in their productivity network compared to their advice and support networks.

Table 7. Summary of Female Ties across Network Type

	Obs.	Mean	Std. Dev.	Min	Max
Productivity Network Female Ties	3,012	3.26	3.18	0	18
Advice Network Female Ties	3,012	4.53	3.18	0	21
Support Network Female Ties	3,012	4.21	2.94	0	21

Tables 8 and 9 present the number of female ties across the three networks by respondent gender. Table 8 presents summary statistics of female ties across the three network types for men in the sample. The men in the sample indicate that they have 0 to 18 female ties in their instrumental network (e.g. – productivity network) and 0 to 21 female ties in their expressive networks (e.g. – advice and support). When comparing the average number of female ties across the three networks, men indicate more female ties in their support and advice networks than their productivity networks.

Table 8. Summary Descriptive Statistics of Female Ties in Men's Networks

Men's networks	Obs.	Mean	Std. Dev.	Min	Max
Productivity Network Female Ties	1738	3.24	2.51	0	18
Advice Network Female Ties	1738	4.14	3.15	0	21
Support Network Female Ties	1738	4.07	2.92	0	21

Table 9 illustrates the summary statistics of the number of female ties across the three networks for women in the sample. Women in the sample indicate having 0 to 20 female ties depending on the network type. Following similar results as the men in the sample, women on average indicate fewer female ties in their productivity networks than their advice and support networks.

Table 9. Summary Descriptive Statistics of Female Ties in Women's Networks

Women's networks	Obs.	Mean	Std. Dev.	Min	Max
Productivity Network Female Ties	1342	3.29	2.40	0	14
Advice Network Female Ties	1342	5.01	3.17	0	20
Support Network Female Ties	1342	4.39	2.95	0	17

Based on tables 8 and 9, on average STEM faculty have more female ties in their expressive networks as compared to their instrumental networks. On average, men have fewer women in their networks as compared to the number of women in women's networks. While men, on average, have fewer women in their networks, the maximum number of women in men's networks (all three types) is higher than in women's networks, indicating that men report larger networks than women, but fewer women on average in their networks.

Respondent Sample Description.

Prior to discussing the results, I present the weighted characteristics of the STEM faculty from the survey respondents. Tables 10 through 12 show the distribution of STEM faculty by rank, department type, and university type. Table 10 reports the comparison of university type between men and women STEM faculty. As seen in table 10, there is an unequal representation of men and women across both university types. Women are equally underrepresented in both research and teaching universities. Male respondents are significantly more likely to work in research focused universities ($p < 0.001$).

Table 10. Gender differences by University Type, Weighted

	Men	**Women**	**Total**	X_2	**p - value**
Research Focused University	975 (29%)	778 (21%)	1753 (50%)	1.97	0.00
Teaching Focused University	1041 (28%)	747 (22%)	1788 (50%)		
Total	2016 (57%)	1525 (43%)	3541 (100%)		

Table 11 presents the response distribution by gender in departments. There is a difference in response rate by gender. Female respondents are significantly more likely, than the male respondents, to work in biology and math departments ($p < 0.001$). Male

STEM faculty, compared to female STEM faculty, are significantly more likely to be in civil engineering departments ($p < 0.001$).

Table 11. Gender Comparison by Department Type, Weighted

	Men	Women	Total	X_2	p - value
Biochemistry	378 (11%)	251 (7%)	629 (18%)	1.40	0.24
Biology	622 (18%)	610 (17%)	1232 (36%)	58.71	0.00
Civil Engineering	442 (12%)	247 (7%)	689 (19%)	19.69	0.00
Mathematics	574 (16%)	417 (12%)	991 (28%)	27.43	0.00
Total	**2016 (57%)**	**1525 (43%)**	**3541 (100%)**		

There are statistically significant differences in response rates for men and women by rank. Table 12 shows the respondent sample distribution of women across tenure-track assistant, associate, and full professor positions. Women in the sample, compared to men are more likely to be in assistant professor positions ($p < 0.001$). Women, compared to men, are significantly more likely to be in associate professor positions ($p < 0.001$). In line with current literature regarding power differences by gender in academia, respondents that are full professors are more likely to be men ($p < 0.001$).

Table 12. Gender Comparison by Rank, Weighted

	Men	Women	Total	X_2	p - value
Assistant Professor	440 (12%)	466 (13%)	934 (25%)	64.85	0.00
Associate Professor	632 (18%)	565 (16%)	1071 (34%)	31.11	0.00
Full Professor	934 (26%)	494 (14%)	1221 (40%)	137.31	0.00
Total	**2006 (56%)**	**1524 (43%)**	**3430 (99%)**		

Model estimation.

The results for the three OLS models, predicting work-life balance, sense of belonging, and self-efficacy with clustered robust errors are reported in tables 13 through

15. Each model reports coefficients and standard errors clustered by department type as each informal network is analyzed from the department level. The models are run on the full sample, separately by university type, and separately by gender within university type. Separating the models by gender enables assessment of the intersection of STEM faculty gender and their informal network types. Independent *t* tests were run to determine if there were differences by the respective dependent variables by university type and gender.

T-test results.

When looking at work-life balance on average, faculty in research focused universities (m = 2.21) reported significantly higher levels of *work-life balance* compared to teaching focused universities (m = 2.28), $t(3021) = 2.74$, $p < 0.01$. When looking at work-life balance on average, women (m = 2.09) reported significantly lower levels of *work-life balance* compared to men (m = 2.43), $t(3021) = 11.97$, $p < 0.001$. When looking at the *sense of belonging*, there are significant differences by university type. On average, STEM faculty in research focused universities (m = 2.61) report significantly lower *sense of belonging* compared to teaching focused universities (m = 2.81), $t(2964) = 10.73$, $p < 0.001$. I find no significant differences in *sense of belonging*, by gender. There are no significant differences of *self-efficacy* perspectives by university type or respondent gender.

Hypotheses Testing

In the following section, I discuss the results testing the hypotheses outlined in Chapter 3. After presenting the results as they pertain to the key independent variables (university type, gender, proportion of women in informal networks), I present results on five control variables across the three dependent variables. The models were estimated using R Statistical Computing Software (R Core Team, 2019).

Results: Work-life Balance.

This next section reports the results of STEM faculty's perceptions of their work-life balance. Work-life balance is measured by the extent to which STEM faculty indicate their views of how they balance work with home and family life. I will present the results of STEM faculty's work-life balance by each hypothesis.

Hypothesis 1a states that STEM faculty in research focused universities, as compared to teaching focused universities, will report significantly lower levels of work-life balance. The full model analysis finds no support for hypothesis 1a. Rather, there is weak support that STEM faculty in research focused universities report significantly higher levels of work-life balance ($\beta = 0.05$, $p < 0.1$).

I find support for hypothesis 2a. Hypothesis 2a states that female STEM faculty, as compared to male STEM faculty, will report significantly lower levels work-life balance in their department. The full model indicates that female STEM faculty report significantly lower levels of work-life balance ($\beta = -0.21$, $p < .001$), as compared to male STEM faculty. Female STEM faculty across university types, report significantly lower work-life balance than men.

Hypothesis 3a expects that STEM faculty with more women in their informal networks (productivity / support / advice) will report higher levels of work-life balance. I find no support for hypothesis 3a. Instead, I find that STEM faculty with more women in their support and advice networks report significantly lower levels of work-life balance. The proportion of women in productivity networks is not significantly related to STEM faculty work-life balance across university type. Having more women in their support networks is related to decreased work-life balance for men, especially at teaching focused universities ($\beta = -0.11$, $p < .1$). The proportion of women in support networks is not significant for STEM faculty in research focused universities nor for women at teaching focused universities. The proportion of women in advice networks is related to significantly lower levels of work-life balance among STEM faculty at research focused universities ($\beta = -0.32$, $p < .01$) for both men ($\beta = -0.27$, $p < .1$) and women ($\beta = -0.68$, $p < .001$). The proportion of women in advice networks is not significantly related to WLB for men or women at teaching focused universities.

Table 13. OLS Model Predicting Work-Life Balance for STEM Faculty.

	Full Model		Research Universities: All		Research Universities: Men		Research Universities: Women		Teaching Universities: All		Teaching Universities: Men		Teaching Universities: Women	
	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE
Research University	0.05+	(0.03)												
Women	-0.21***	(0.03)	-0.21***	(0.05)					-0.21***	(0.04)				
% Women in Productivity Networks	-0.00	(0.07)	0.02	(0.11)	0.10	(0.18)	-0.07	(0.12)	-0.06	(0.06)	-0.01	(0.10)	-0.09	(0.11)
% Women in Support Networks	-0.00	(0.33)	0.04	(0.48)	0.06	(0.53)	0.11	(0.28)	-0.12+	(0.06)	-0.11+	(0.06)	-0.02	(0.19)
% Women in Advice Networks	-0.21*	(0.1)	-0.32**	(0.12)	-0.27+	(0.15)	-0.68***	(0.09)	0.18	(0.15)	0.23	(0.17)	0.04	(0.42)
% Women in Department	0.09	(0.12)	0.11	(0.20)	0.39	(0.32)	-0.31+	(0.18)	0.06	(0.14)	0.07	(0.26)	0.04	(0.12)
% Women Full Profs in University	-0.19	(0.26)	-0.41	(0.43)	-0.39	(0.38)	-0.21	(0.34)	0.25***	(0.04)	0.32*	(0.13)	0.34	(0.23)
Faculty department size	-0.01	(0.01)	-0.01	(0.01)	-0.02***	(0.00)	0.01	(0.01)	0.00	(0.01)	0.00	(0.01)	0.01	(0.02)
Biochemistry	-0.09*	(0.04)	-0.06*	(0.03)	0.06	(0.04)	-0.33***	(0.05)	-0.05	(0.03)	-0.13**	(0.05)	0.09+	(0.05)
Biology	-0.18***	(0.02)	-0.15***	(0.01)	-0.16***	(0.04)	-0.07*	(0.03)	-0.18***	(0.03)	-0.20***	(0.04)	-0.07*	(0.03)
Civil Engineering	-0.14***	(0.04)	-0.10+	(0.05)	-0.01	(0.13)	-0.12*	(0.06)	0.001	(0.03)	0.03	(0.05)	-0.09	(0.07)
Assistant Professor	-0.22+	(0.12)	-0.17	(0.14)	-0.22	(0.19)	-0.01	(0.11)	-0.25*	(0.11)	-0.33	(0.22)	-0.10	(0.22)
Associate Professor	-0.15	(0.12)	-0.09	(0.18)	-0.11	(0.23)	-0.01	(0.15)	-0.23***	(0.04)	-0.29***	(0.05)	-0.12	(0.16)
Marriage-Like Relationship	-0.14***	(0.03)	-0.23***	(0.05)	-0.23*	(0.12)	-0.33***	(0.05)	0.04	(0.03)	0.02	(0.09)	-0.02	(0.17)
Tenure Clock Change	-0.05	(0.07)	-0.04	(0.08)	0.04	(0.14)	-0.18**	(0.06)	-0.07	(0.07)	0.12	(0.18)	-0.23***	(0.05)
Dependent Care	-0.16**	(0.06)	-0.16+	(0.09)	-0.12	(0.17)	-0.09	(0.09)	-0.19***	(0.04)	-0.16**	(0.05)	-0.24*	(0.11)
Underrepresented Minority	-0.02	(0.11)	-0.09	(0.16)	-0.19	(0.18)	0.13*	(0.06)	0.14	(0.15)	0.09	(0.26)	0.13*	(0.05)
Log(Salary)	0.04	(0.22)	0.03	(0.3)	0.04	(0.4)	-0.05	(0.17)	-0.02	(0.16)	-0.09	(0.21)	0.12	(0.29)
Log(Bibliometric Publications)	0.04	(0.03)	0.08+	(0.04)	0.12	(0.07)	-0.01	(0.05)	0.00	(0.04)	-0.03	(0.06)	0.07***	(0.02)
Log(Teaching Grant Average)	0.03	(0.05)	0.05	(0.10)	0.13	(0.16)	-0.27*	(0.11)	-0.04	(0.04)	-0.05	(0.08)	-0.01	(0.25)
Log(Research Grant Average)	0.05	(0.05)	-0.02	(0.08)	-0.04	(0.12)	0.02	(0.03)	0.14**	(0.05)	0.15*	(0.06)	0.12	(0.09)
Log(Teaching Load Average)	-0.87***	(0.11)	-0.87***	(0.15)	-1.00***	(0.26)	-0.84***	(0.1)	-0.97***	(0.08)	-0.83***	(0.09)	-1.44***	(0.27)
Friends	0.02***	(0.01)	0.02*	(0.01)	0.02***	(0.01)	-0.00	(0.01)	0.03***	(0.01)	0.02**	(0.01)	0.05+	(0.03)
LengthRelationship	-0.01	(0.05)	0.04	(0.06)	-0.02	(0.15)	0.04	(0.05)	-0.11*	(0.05)	-0.16*	(0.06)	-0.02	(0.22)
Dept Network Density	0.23***	(0.04)	0.37***	(0.03)	0.53***	(0.11)	0.18	(0.23)	-0.06	(0.06)	-0.08	(0.06)	-0.07	(0.19)
Female Dept Network Density	-0.10+	(0.05)	-0.19*	(0.09)	-0.31+	(0.18)	0.34**	(0.10)	0.01	(0.10)	0.10	(0.10)	-0.21	(0.25)
Network Size	-0.01	(0.01)	0.00	(0.01)	0.00	(0.01)	0.02***	(0.01)	-0.02***	(0.00)	-0.03***	(0.01)	-0.03+	(0.02)
Senior Female Faculty Dept Ties	0.02	(0.02)	0.03+	(0.02)	0.10	(0.07)	-0.09*	(0.04)	0.03	(0.06)	-0.01	(0.09)	0.12	(0.09)

Tenure-Track URM Faculty in University	0.00	(0.00)	0.00	(0.00)	**0.00****	**(0.00)**	**-0.00****	**(0.00)**	-0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)
Tenure-Track University Faculty	-0.00	(0.00)	-0.00	(0.00)	**-0.00*****	**(0.00)**	**0.00**$^{+}$	**(0.00)**	-0.00	(0.00)	0.00	(0.00)	-0.00+	(0.00)
Constant	5.77*	(2.25)	5.74+	(2.95)	5.95	(4.14)	6.63***	(1.59)	7.04***	(1.76)	7.43**	(2.41)	6.87*	(3.36)
Observations	1,442		729		391		338		713		425		288	
R^2	0.19		0.21		0.22		0.21		0.23		0.22		0.29	
Adjusted R^2	0.18		0.18		0.16		0.13		0.19		0.16		0.21	
Residual Std. Error	1.00 (df = 1411)		1.19 (df = 699)		1.37 (df = 362)		0.92 (df = 309)		0.74 (df = 683)		0.79 (df = 396)		0.67 (df = 259)	
F-Statistic	11.21*** (df = 30; 1411)		6.44*** (df = 29; 699)		3.65*** (df = 28; 362)		2.87*** (df = 28; 309)		6.92*** (df = 29; 683)		3.89*** (df = 28; 396)		3.70*** (df = 28; 259)	

Results: Sense of belonging.

This section reports the results related to sense of belonging, which is measured as the extent to which STEM faculty view their fit with their department. Sense of belonging was derived from eight questionnaire items (see Appendix A). I present results for sense of belonging for each of the hypotheses below.

I find support for hypothesis 1b, which expects that STEM faculty in research focused universities, as compared to teaching focused universities, will report significantly lower levels of sense of belonging in their department. I find that STEM faculty in research focused universities, as compared to teaching focused universities report significantly lower levels of sense of belonging ($\beta = -0.16$, $p < .01$).

I do not find support for hypothesis 2b, which expected that female STEM faculty would report significantly lower levels of sense of belonging in their departments as compared to male STEM faculty. There are no significant differences in sense of belonging for men and women across university types.

Hypothesis 3b predicts that STEM faculty with a higher proportion of women in their informal networks (productivity / support / advice) will report higher levels of sense of belonging. I find moderate support for hypothesis 3b. STEM faculty with a high proportion of women in their productivity network report higher levels of sense of belonging ($\beta = 0.12$, $p < .05$). This finding is primarily driven by the proportion of women in productivity networks within research focused universities ($\beta = 0.16$, $p < .05$). There are no significant differences in the proportion of women in productivity networks and sense of belonging for men and women in research focused universities. Female

STEM faculty with more women in their support networks report significantly lower levels of sense of belonging in research universities ($\beta = -0.38$, $p < .001$). There are no significant findings for both men and women in teaching universities that have a proportion of women in their support networks. STEM faculty with a proportion of women in their advice network report higher levels of sense of belonging ($\beta = 0.10$, $p < .05$). STEM faculty in research focused universities with a proportion of women in their advice networks report significantly higher levels of sense of belonging ($\beta = 0.11$, $p < .001$). This finding is driven by male STEM faculty, where male STEM faculty report significantly higher levels of sense of belonging when there is a proportion of women in their advice networks ($\beta = 0.11$, $p < .1$). There are no significant findings for female STEM faculty in research focused universities with a proportion of women in their advice networks. Additionally, there are no significant findings for STEM faculty related to their gendered advice networks at teaching universities.

Table 14. OLS Model Predicting Sense of Belonging for STEM Faculty.

	Full Model		Research Universities: All		Research Universities: Men		Research Universities: Women		Teaching Universities: All		Teaching Universities: Men		Teaching Universities: Women	
	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE
Research University	-0.16**	(0.06)												
Women	0.01	(0.07)	0.00	(0.10)					0.01	(0.02)				
% Women in Productivity Networks	0.12*	(0.06)	0.16*	(0.07)	0.23	(0.17)	-0.06	(0.17)	0.07	(0.07)	0.10	(0.08)	-0.02	(0.11)
% Women in Support Networks	0.08	(0.11)	0.09	(0.17)	0.17	(0.20)	-0.38***	(0.07)	0.02	(0.04)	0.08	(0.07)	-0.1	(0.14)
% of Women in Advice Networks	0.10**	(0.03)	0.11***	(0.03)	0.11+	(0.07)	0.24	(0.19)	0.06	(0.10)	0.04	(0.10)	0.19	(0.23)
% Women in Department	-0.09	(0.14)	-0.13	(0.12)	-0.20	(0.21)	0.03	(0.12)	0.04	(0.17)	0.05	(0.27)	0.09	(0.09)
% Women Full Profs in University	0.09	(0.18)	0.22	(0.24)	0.30	(0.32)	-0.12	(0.11)	-0.16*	(0.06)	-0.17+	(0.09)	-0.34+	(0.19)
Faculty Department Size	-0.00	(0.00)	0.01+	(0.00)	0.00	(0.00)	0.01*	(0.00)	-0.00	(0.01)	-0.00	(0.01)	-0.01*	(0.01)
Biochemistry	-0.00	(0.01)	-0.07***	(0.02)	-0.11***	(0.02)	0.09+	(0.05)	0.01	(0.01)	0.04+	(0.02)	-0.05	(0.07)
Biology	0.02+	(0.01)	0.06**	(0.02)	0.01	(0.02)	0.22***	(0.03)	-0.07**	(0.02)	-0.08+	(0.04)	-0.09*	(0.04)
Civil Engineering	-0.03+	(0.02)	-0.06	(0.05)	-0.16**	(0.06)	0.18***	(0.01)	-0.02	(0.02)	-0.05	(0.04)	0.06	(0.05)
Assistant Professor	0.07***	(0.02)	0.10*	(0.04)	0.16+	(0.09)	-0.03	(0.06)	0.03	(0.06)	0.05	(0.07)	-0.08	(0.13)
Associate Professor	-0.03	(0.06)	-0.04	(0.09)	0.02	(0.08)	-0.21	(0.14)	-0.01	(0.02)	0.02	(0.05)	-0.12	(0.11)
Marriage-Like Relationship	0.03	(0.02)	0.00	(0.04)	-0.03	(0.04)	0.08	(0.05)	0.06	(0.08)	0.04	(0.06)	0.08	(0.11)
Tenure Clock Change	-0.08+	(0.05)	-0.13*	(0.06)	-0.15	(0.14)	-0.14***	(0.04)	0.07***	(0.02)	0.16*	(0.07)	-0.02	(0.06)
Dependent Care	-0.03*	(0.01)	-0.08***	(0.01)	-0.10***	(0.02)	-0.02	(0.06)	0.09*	(0.04)	0.11	(0.07)	0.03	(0.04)
Underrepresented Minority	-0.02	(0.06)	-0.00	(0.08)	-0.02	(0.09)	-0.02	(0.09)	-0.05	(0.05)	-0.04	(0.08)	-0.03	(0.04)
Log(Salary)	0.13+	(0.07)	0.15+	(0.09)	0.19	(0.12)	0.06	(0.11)	-0.06	(0.09)	-0.04	(0.04)	-0.08	(0.22)
Log(Bibliometric Publications)	-0.00	(0.02)	0.00	(0.04)	-0.03	(0.04)	0.03	(0.04)	-0.01	(0.01)	-0.03+	(0.02)	0.06*	(0.03)
Log(Teaching Grant Average)	0.01	(0.01)	0.03+	(0.02)	0.04*	(0.02)	-0.01	(0.05)	-0.09**	(0.03)	-0.12***	(0.03)	-0.03	(0.06)
Log(Research Grant Average)	-0.11**	(0.04)	-0.10	(0.07)	-0.08	(0.08)	-0.12**	(0.04)	-0.04***	(0.01)	-0.02	(0.02)	-0.12***	(0.01)
Log(Teaching Load Average)	0.05	(0.06)	0.06	(0.05)	0.12	(0.09)	-0.02	(0.02)	-0.03	(0.04)	-0.03	(0.10)	0.06	(0.18)
Friends	-0.00	(0.01)	0.00	(0.02)	-0.00	(0.02)	0.01	(0.01)	-0.01	(0.00)	-0.01+	(0.00)	0.00	(0.01)
LengthRelationship	0.03	(0.10)	-0.01	(0.11)	0.01	(0.16)	-0.03	(0.08)	0.21***	(0.03)	0.21**	(0.07)	0.22**	(0.08)
Dept Network Density	0.06	(0.13)	0.03	(0.20)	-0.08	(0.23)	0.24+	(0.13)	0.38***	(0.10)	0.37***	(0.10)	0.32*	(0.14)

Female Dept Network Density	**-0.20***	**(0.08)**	**-0.23*****	**(0.06)**	**-0.18*****	**(0.05)**	**-0.38*****	**(0.02)**	**-0.20+**	**(0.10)**	**-0.24**	**(0.19)**	**-0.16*****	**(0.04)**
Network Size	**0.02***	**(0.01)**	0.01	(0.01)	0.01	(0.02)	**0.02+**	**(0.01)**	**0.03*****	**(0.01)**	**0.03*****	**(0.01)**	**0.03*****	**(0.01)**
Senior Female Faculty Dept Ties	**0.07*****	**(0.01)**	**0.05***	**(0.02)**	0.03	(0.03)	**0.10*****	**(0.03)**	**0.10*****	**(0.02)**	**0.08****	**(0.03)**	**0.14*****	**(0.03)**
Tenure- Track URM Faculty in University	**-0.00*****	**(0.00)**	-0.00	(0.00)	**-0.00***	**(0.00)**	0.00	(0.00)	-0.00	(0.00)	**-0.00***	**(0.00)**	0.00	(0.00)
Tenure-Track University Faculty	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	**-0.00+**	**(0.00)**	**-0.00*****	**(0.00)**	**-0.00*****	**(0.00)**	**-0.00*****	**(0.00)**
Constant	0.68	(0.68)	0.34	(0.75)	-0.25	(1.44)	**1.98+**	**(1.17)**	**2.79***	**(1.21)**	**2.62*****	**(0.65)**	2.52	(3.34)
Observations	1,442		725		388		337		717		424		293	
R^2	0.10		0.11		0.13		0.24		0.18		0.22		0.17	
Adjusted R^2	0.08		0.07		0.06		0.17		0.15		0.17		+	
Residual Std. Error	0.74 (df = 1411)		0.84 (df = 695)		0.97 (df = 359)		0.65 (df = 308)		0.58 (df = 687)		0.62 (df = 395)		0.53 (df = 264)	
F-Statistic	5.40*** (df = 30; 1411)		2.98*** (df = 29; 695)		1.93*** (df = 28; 359)		3.41*** (df = 28; 308)		5.20*** (df = 29; 687)		4.03*** (df = 28; 395)		1.91*** (df = 28; 264)	

Results: Self-Efficacy.

This section reports the results of the models predicting STEM faculty's self-efficacy. As indicated in the data and methods chapter, self-efficacy is derived from ten questionnaire items. Below I outline the results as related to the self-efficacy hypotheses.

I do not find support for H1c that predicted that STEM faculty in research focused universities, as compared to teaching focused universities, will report significantly lower levels of self-efficacy In contrast, I find that STEM faculty in research focused universities, compared teaching focused universities, report significantly lower levels of self-efficacy ($\beta = -0.04$, $p < .1$).

There is no support for H2c, which predicted that female STEM faculty, as compared to male STEM faculty, will report significantly lower levels self-efficacy in their department.. Female STEM faculty, compared to male STEM faculty, do not report significant different levels of self-efficacy. There are no significant differences in self-efficacy across university types by gender.

There are mixed findings for H3b. H3b predicts that the increased proportion of women in informal networks (productivity / support / advice) will be related to higher levels of self-efficacy. There are no significant differences for STEM faculty's self-efficacy when they report a proportion of women in their productivity networks across research and teaching focused universities. When looking at the gender of STEM faculty and the proportion of women in their productivity networks, female STEM faculty in research focused universities report significantly lower levels of self-efficacy when there are more women in their productivity networks ($\beta = -0.18$, $p < .001$). There are no significant findings related to self-efficacy for men in research focused universities and for men and women within teaching focused universities. STEM faculty with more women in their support networks report higher levels of self-efficacy ($\beta = 0.13$, $p < .05$). STEM faculty in research focused universities with more women in their support networks report significantly higher levels of self-efficacy ($\beta = 0.14$, $p < .1$). Female STEM faculty in research focused universities report higher levels of self-efficacy when there is an increased proportion of women in their support networks ($\beta = 0.26$, $p < .001$). There are no significant findings for male STEM faculty with a proportion of women in their support networks. STEM faculty in teaching focused universities report significantly higher levels of self-efficacy when there is a large proportion of women in their support networks ($\beta = 0.12$, $p < .05$). In teaching focused universities, male STEM faculty ($\beta = 0.09$, $p < .05$) and female STEM faculty ($\beta = 0.21$, $p < .001$) report significantly higher levels of self-efficacy when there are more women in their support networks. STEM faculty with a large proportion of women in their advice networks do not report any significant differences in their self-efficacy. There are no significant findings for STEM faculty's self-efficacy in research focused universities and by gender when they report a large proportion of women in their advice network. Female STEM faculty in teaching focused universities are significantly more likely to report lower levels of self-efficacy when there is a proportion of women in their advice networks ($\beta = -0.18$, $p < .05$).

Table 15. OLS Model Predicting Self-Efficacy for STEM Faculty.

	Full Model		Research Universities: All		Research Universities: Men		Research Universities: Women		Teaching Universities: All		Teaching Universities: Men		Teaching Universities: Women	
Research University	-0.04+	(0.02)												
Women	0.04	(0.05)	0.06	(0.06)					0.01	(0.02)				
% Women in Productivity Networks	0.00	(0.02)	-0.00	(0.07)	0.08	(0.08)	-0.18***	(0.04)	0.01	(0.04)	-0.05	(0.07)	0.08	(0.07)
% Women in Support Networks	0.13*	(0.06)	0.14+	(0.09)	0.14	(0.14)	0.26***	(0.07)	0.12*	(0.06)	0.09*	(0.04)	0.21***	(0.04)
% of Women in Advice Networks	-0.05	(0.04)	-0.07	(0.06)	-0.12	(0.08)	-0.05	(0.11)	-0.01	(0.06)	0.03	(0.08)	-0.18*	(0.08)
% Women in Dept	-0.06	(0.05)	-0.09	(0.07)	-0.12	(0.16)	-0.03	(0.16)	0.08**	(0.03)	0.16*	(0.06)	-0.04	(0.06)
% Women Full Profs in University	-0.02	(0.09)	0.04	(0.11)	0.24	(0.20)	-0.30**	(0.11)	-0.25*	(0.11)	-0.21+	(0.11)	-0.41***	(0.11)
Faculty Dept Size	0.00	(0.00)	-0.00	(0.00)	-0.01***	(0.00)	0.00	(0.01)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Biochemistry	0.08+	(0.04)	0.12+	(0.07)	0.24***	(0.04)	-0.19***	(0.06)	0.02	(0.02)	0.06***	(0.01)	-0.08***	(0.01)
Biology	0.06**	(0.02)	0.07	(0.04)	0.18***	(0.02)	-0.21***	(0.03)	0.04***	(0.01)	0.06**	(0.02)	-0.02	(0.02)
Civil Engineering	0.05	(0.03)	0.07	(0.06)	0.19***	(0.05)	-0.34***	(0.05)	-0.01	(0.02)	0.06*	(0.02)	-0.17***	(0.02)
Assistant Professor	-0.01	(0.03)	-0.03	(0.08)	-0.12	(0.13)	-0.00	(0.13)	-0.02	(0.05)	-0.06**	(0.02)	0.07***	(0.02)
Associate Professor	-0.01	(0.02)	-0.02	(0.03)	-0.06	(0.07)	-0.10***	(0.02)	-0.01	(0.05)	-0.01	(0.02)	0.03	(0.02)
Marriage-Like Relationship	0.11*	(0.05)	0.14*	(0.06)	0.23*	(0.09)	-0.02	(0.02)	0.08***	(0.02)	0.10***	(0.01)	0.05**	(0.01)
Tenure Clock Change	-0.03	(0.07)	-0.04	(0.10)	-0.12	(0.09)	0.00	(0.10)	-0.01	(0.03)	0.02*	(0.01)	-0.05***	(0.01)
Dependent Care	-0.00	(0.06)	0.00	(0.07)	-0.02	(0.06)	0.00	(0.08)	-0.00	(0.04)	-0.02	(0.04)	0.09*	(0.04)
Underrepresented Minority	-0.06	(0.11)	-0.03	(0.15)	-0.04	(0.16)	-0.00	(0.07)	-0.05	(0.03)	-0.00	(0.05)	-0.12*	(0.05)
Log(Salary)	0.30***	(0.07)	0.34***	(0.10)	0.39**	(0.13)	0.31***	(0.04)	0.23***	(0.03)	0.21*	(0.08)	0.19*	(0.08)
Log(Bibliometric Publications)	-0.04*	(0.02)	-0.04	(0.03)	-0.09***	(0.01)	0.02	(0.04)	-0.04***	(0.01)	-0.04***	(0.01)	-0.03**	(0.01)
Log(Teaching Grant Average)	0.10*	(0.04)	0.12*	(0.06)	0.18*	(0.09)	-0.02	(0.05)	0.08*	(0.03)	0.05	(0.03)	0.14***	(0.03)
Log(Research Grant Average)	0.07**	(0.02)	0.07*	(0.03)	0.02	(0.03)	0.13*	(0.06)	0.06*	(0.03)	0.07+	(0.04)	0.02	(0.04)
Log(Teaching Load Average)	-0.03	(0.04)	-0.01	(0.04)	0.04	(0.07)	0.01	(0.16)	-0.02	(0.05)	-0.05	(0.06)	0.13*	(0.06)
Friends	0.02**	(0.01)	0.03***	(0.01)	0.03***	(0.01)	0.01	(0.01)	0.02	(0.01)	0.03+	(0.01)	-0.00	(0.01)
LengthRelationship	-0.06	(0.08)	-0.08	(0.10)	-0.21	(0.24)	0.11	(0.08)	-0.02	(0.09)	0.01	(0.14)	-0.14	(0.14)
Dept Network Density	-0.27***	(0.05)	-0.32**	(0.12)	-0.34+	(0.19)	-0.20	(0.23)	-0.20+	(0.11)	-0.35***	(0.08)	-0.04	(0.08)

Female Dept Network Density	0.09	(0.08)	0.18	(0.12)	0.19	(0.15)	0.03	(0.15)	-0.02	(0.07)	0.04	(0.10)	-0.04	(0.10)
Network Size	0.00	(0.01)	-0.00	(0.01)	-0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Senior Female Faculty Dept Ties	-0.00	(0.03)	0.00	(0.04)	**0.18*** **	**(0.05)**	-0.06	(0.04)	-0.01	(0.01)	**0.02***	**(0.01)**	**-0.06*** **	**(0.01)**
Tenure- Track URM Faculty in University	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	**0.00** **	**(0.00)**
Tenure-Track University Faculty	0.00	(0.00)	0	(0.00)	0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	**-0.00+**	**(0.00)**
Constant	-0.63	(0.78)	-1.13	(1.39)	-1.38	(1.61)	-0.96	(0.80)	-0.07	(0.43)	0.25	(0.56)	0.27	(0.56)
Observations	1,356		684		371		313		672		399		273	
R^2	0.15		0.17		0.29		0.19		0.13		0.20		0.14	
Adjusted R^2	0.13		0.13		0.23		0.11		0.09		0.14		0.05	
Residual Std. Error	0.63 (df = 1325)		0.77 (df = 654)		0.83 (df = 342)		0.61 (df = 284)		0.47 (df = 642)		0.47 (df = 370)		0.45 (df = 244)	
F-Statistic	7.70*** (df = 30; 1325)		4.59*** (df = 29; 654)		5.02*** (df = 28; 342)		2.42*** (df = 28; 284)		3.37*** (df = 28; 642)		3.25*** (df = 28; 370)		1.45 (df = 28; 244)	

Results: Control Variables.

In this section, I discuss five control variables (associate professor, salary, publications, teaching course load, friendship ties) and their relationship in the work-life balance, sense of belonging, and self-efficacy models. There were no control variables that were significant across all three models. Therefore, I only discuss significant control variables from the five control variables of focus in this section across each respective model.

Work-life balance.

Four control variables were significant across the work-life balance model. I will be discussing the findings for associate professors, publication, teaching course load, and friendship ties for work-life balance outcomes. STEM faculty that are associate professors in teaching universities report significantly lower levels of work-life balance ($\beta = -0.23$, $p < .001$). Male STEM faculty that are associate professors in teaching universities report significantly lower levels of work-life balance ($\beta = -0.29$, $p < .001$). There are no significant findings for female STEM faculty that are associate professors in teaching focused universities. STEM faculty in research focused universities that report a higher level of publications are significantly more likely to report higher levels of work-life balance ($\beta = 0.08$, $p < .1$). Female STEM faculty in teaching universities are significantly more likely to report higher levels of work-life balance when they have a higher level of publications ($\beta = 0.07$, $p < .001$). There are is not a significant relationship between number of publications and WLB for male STEM faculty in teaching focused universities. STEM faculty across research universities ($\beta = -0.11$, $p < .001$) and teaching universities ($\beta = -0.97$, $p < .001$) report significantly lower levels of work-life balance when they report a high course teaching load. This is true for both men ($\beta = -1.00$, $p < .001$) and women ($\beta = -0.84$, $p < .001$) in research focused universities. In teaching focused universities, men ($\beta = -0.83$, $p < .001$) and women ($\beta = -1.44$, $p < .001$) report similar work-life balance when they have higher course loads. STEM faculty with more friends in their department both in research focused universities ($\beta = 0.02$, $p < .05$) and teaching focused universities ($\beta = 0.03$, $p < .001$) report higher levels of work-life balance. Men in research focused universities ($\beta = 0.02$, $p < .001$) and teaching focused universities ($\beta = 0.02$, $p < .001$) with more friends in their department report significantly higher work-life balance. There are no significant relationships between work-life balance and friendship ties for women in both research focused and teaching focused universities.

Sense of Belonging.

The following control variables are significant in the models predicting sense of belonging: salary and publications. STEM faculty with higher salary report significantly higher sense of belonging ($\beta = 0.13$, $p < .1$). At research-focused universities, salary is positively related to sense of belonging ($\beta = 0.15$, $p < .1$). Publications are significantly related to sense of belonging for faculty at teaching focused universities, but not at research focused universities. Publications are negatively related to sense of belonging ($\beta = -0.03$, $p < .1$) for male STEM faculty in teaching focused universities and positively related to sense of belonging ($\beta = 0.06$, $p < .05$) for female STEM faculty in teaching focused universities. Teaching course loads are not significantly related to = faculty's sense of belonging at research and teaching focused universities. Having friends in the department is not significantly related to sense of belonging for STEM faculty at research focused universities, but male STEM faculty with more friends in their department report significantly lower levels of sense of belonging at teaching universities ($\beta = -0.01$, $p < .1$).

Self-efficacy.

All five control variables (associate professor, salary, publications, teaching course load, and friendship ties) that I am focusing on in this section are significant. Female STEM faculty that are associate professors, compared to male STEM faculty, report significantly higher self-efficacy in research focused universities. STEM faculty with higher salary report significantly higher levels of self-efficacy ($\beta = 0.30$, $p < .001$) at both research focused universities ($\beta = 0.34$, $p < .001$) and teaching focused universities ($\beta = 0.23$, $p < .001$). Salary levels for male ($\beta = 0.39$, $p < .001$) and female ($\beta = 0.31$, $p < .001$) STEM faculty in research focused universities significantly and positively related to self-efficacy. Male STEM faculty ($\beta = 0.21$, $p < .05$) and female STEM faculty ($\beta = 0.19$, $p < .05$) in teaching focused universities with higher salary report significantly higher levels of self-efficacy. STEM faculty in teaching focused universities with more publications report significantly lower self-efficacy ($\beta = -0.04$, $p < .001$). Men ($\beta = -0.04$, $p < .001$); the relationship between publications and self-efficacy is negative for women ($\beta = -0.03$, $p < .001$) in teaching universities. Male STEM faculty in research focused universities report significantly lower levels of self-efficacy when they have more publications ($\beta = -0.09$, $p < .001$). There are no significant findings based on salary for female STEM faculty in research focused universities. Female STEM faculty, compared to male STEM faculty, in teaching focused universities with higher course teaching loads report significantly higher levels of self-efficacy ($\beta = 0.13, p < .05$). There are no significant findings for STEM faculty's self-efficacy with a higher teaching load in research focused universities. STEM faculty in research focused universities, compared to teaching focused universities, with more friends report significantly higher levels of self-efficacy ($\beta = -0.21, p < .001$).

Data limitations

This section describes the data and methodological limitations of this study, including limitations related to common method bias, measurement limitations, and data collection.

First, a limitation of this study is measurement. This study only takes into account respondents' perceptions of their psychosocial outcomes within their departments. It does not take into account internal department or university policies that may be focused on work-life balance or organizational culture initiatives or other factors that might shape work-life balance (e.g. partner commitment), sense of belonging (e.g. confidence, religious beliefs), and self-efficacy (e.g. personality). Various departments and universities across the United States may be taking various internal initiatives to better assist their faculty members with the psychosocial outcomes measured in this study. To take into account the external factors that may influence work-life balance, I control respondent's being in a marriage-like relationship and/or providing dependent care. Additionally, I control for other external factors related to sense of belonging and self-efficacy by controlling for the types of relationships a respondent has within their departments, their rank, and performance measures. Future research should take into account the internal policies, if any, that departments or universities may have for faculty members as it pertains to work life balance. Additionally, future research should consider department mentoring programs and faculty development programs to further understand the psychosocial outcomes for STEM faculty.

Data collection is the final empirical limitation of this study. The data in this study is cross sectional and therefore causal claims cannot be made. Respondent's perceptions of their psychosocial outcomes within their department could change overtime. Additionally, over time departments and universities could change their initiatives on the psychosocial outcomes that are of interest of this study.

CHAPTER 6

DISCUSSION AND CONCLUSION

This chapter discusses the main findings and conclusions for this study. This chapter is organized with the following sections: discussion of results, theoretical limitations and contributions, implications for practice and policy, and opportunities for future research. The first section discussion the results of the statistical analysis. The second section discusses some of the theoretical limitations and contributions of the study. The third section discusses implications from the results for practice and policy for both universities and organizations in general. The final section outlines opportunities for future research.

Discussion of Results

The purpose of this study was to understand how, if at all the proportion of women in informal networks, both instrumental and expressive networks, influence psychosocial outcomes within gendered university settings for STEM faculty. The proportion of women in informal networks provides a deeper understanding of what management scholars refer to as an “informal organization”. Informal organizations encompass the emotional aspects of human behavior in organizations, where the social ties and relationships not formally established within organizational structure are shaped (Kanter, 1977; Mayo, 1933). Mary Parker Follett (1941) first attributed this emotional or sentimental aspect of informal organization to women. Follett assessed how women exercised their emotional talents through her experience working within social welfare organizations. Follett’s interest in women’s roles in organizations came when watching how women were able to take charge and how their participation, communication, and leadership styles based upon emotional aspects affected organizational outcomes (Follett, 1941). Today, women still provide the majority of emotional support or emotional labor in the workplace (Guy, Newman, & Mastracci, 2014; Meier et al., 2015). Research that focuses on gender, explores how women in historically male-dominated organizations are able to further integrate in the workforce (Kanter, 1977; Stivers, 1990; Riccucci, 2009). While women's representation has increased across universities, women still experience issues related to a lack of representation across rank and discipline, a gender salary gap, and are less likely to hold leadership roles within universities (American Council on Education, 2017). Therefore, understanding how these informal relationships within disciplines considered to be male dominated is vital in understanding psychological and social outcomes for faculty at research and teaching universities.

Research suggests that there is little benefit for university faculty, especially female faculty, to have a network comprised of women for professional outcomes (Ibarra, 1992; 1993). Recent research suggests that it is beneficial for faculty to have mixed gender networks that are equally comprised of both men and women, but that having more women than men in the network leads to negative outcomes (McPherson, Smith-Lovin, & Cook, 2001). Mentoring research offers an example of how important networks are for non-productivity outcomes. Furthermore, the majority of research focused on faculty networks and gender looks primarily only at one type of university, research universities. Additional research is needed to focus upon the emotional aspect of workplace relationships and how they shape outcomes. The mentoring literature offers some guidance in this area, with a strong focus on understanding psychosocial outcomes (Fox, 2003; Gardiner et al., 2015). Because organizations rely on women for the provision of emotional labor and support in the workplace, I am interested in understanding how the proportion of women in informal faculty networks influence psychosocial outcomes for both male and female faculty across all types of universities.

This study integrates feminist theory as it applies to gendered organizations, gender roles, and gendered networks at universities in the United States. The underlying assumption is that certain university structures are inherently masculine orientated and that female faculty within these work environments provide the majority of emotional support for both male and female faculty. Moreover, these human relational organizational outcomes such as perceptions of work-life balance, sense of belonging, and self-efficacy may be influenced by the university type (e.g. gendered work expectations), gender of the faculty member, and the gendered composition of individual networks. Women, compared to men, are considered to be sensitive and supportive in the workplace. Based on previous literature (Guy & Newman, 2006; Sabharwal, 2014; Stivers, 1990), I argue that these gendered characteristics may be a reason for STEM faculty to report higher levels of psychological and social outcomes when they have more women in their networks.

STEM disciplines traditionally have a low presence of women (Nielsen et al., 2005). Due to this the NETWISE II survey purposefully oversamples women across both research and teaching focused universities in the United States. This data provide insight into how both male and female faculty perceive their work environment and how the proportion of women in their productivity, support, and advice networks influence these perspectives. Descriptive information on the respondents in the sample show that women are differently represented when it comes to rank and department type. In line with previous research, female faculty are typically less likely to be in leadership positions and higher ranks in the academy (Fox, 2005; NSF, 2018).

I presented a set of hypotheses on university type, gender, and the proportion of women in networks in chapter 3. The results of the data analysis show only partial support for my hypotheses, as indicated in table 16. I find that a high proportion of women in informal networks overall does affect psychosocial outcomes for STEM faculty across universities. I discuss the results in more detail in the following paragraphs.

Table 16. Overview of Hypotheses Findings

Hypotheses	
University type	
H1a. STEM faculty in research focused universities, as compared to teaching focused universities, will report lower levels of work-life balance.	Not supported
H1b. STEM faculty in research focused universities, as compared to teaching focused universities, will report lower sense of belonging.	Supported
H1c. STEM faculty in research focused universities, as compared to teaching focused universities, will report lower levels of self-efficacy.	Supported
Gender	
H2a. Female STEM faculty, compared to male STEM faculty, will report lower levels of work-life balance.	Supported
H2b. Female STEM faculty, compared to male STEM faculty, will report lower sense of belonging.	Not supported

H2c. Female STEM faculty, compared to male STEM faculty, will report lower levels of self-efficacy.	Not supported
Expressive Networks: Proportion of Women	
H3a. STEM faculty with a high proportion of women in their informal networks (productivity / support / advice) will report positive work-life balance.	Not supported
H3b. STEM faculty with a high proportion of women in their informal networks (productivity / support / advice) will report positive sense of belonging.	Partial Support
H3c. STEM faculty with a high proportion of women in their informal networks (productivity / support / advice) will report positive self-efficacy.	Partial Support

University type

This study argues that psychosocial outcomes for STEM faculty will be significantly lower in research focused universities as compared to teaching focused universities. Previous research suggests that research focused universities are considered to be the main force that is shaping the academic labor market as they are considered to be more prestigious than teaching focused universities (Federkeil, van Vught, & Westerheijden, 2012; Pienhero et al., 2017). Studies that focus on STEM faculty typically focus on research focused universities. Relatively few studies look at how STEM faculty's outcomes may vary by university type, and even fewer focus on psychosocial outcomes. Overall the results show that STEM faculty report lower levels of psychosocial outcomes (sense of belonging and self-efficacy) in research focused universities, with the exception of work-life balance outcomes. I provide some explanation for these results.

When considering work-life balance outcomes career choices in academia are often related to the to the type of PhD granting institution that one attends; preferences for academic careers often match PhD programs (Pinheiro et al., 2017). It may be that those with faculty positions in research focused universities have become accustomed to the work expectations within these types of institutions from having received training in these types of universities. Therefore, faculty members may be reporting higher levels of work-life balance in research focused universities because they have had the opportunity to develop an understanding of the rigor and focus of time needed in research focused universities – or self selected into these careers. These findings may be associated with self-selection factors and doctoral training from different university types. Future research should investigate what factors may influence the types of doctoral granting institutions one chooses to work at. Higher salary does not seem to influence perceptions of work-life balance for faculty members in this study. Based upon the finding that faculty in research-focused universities report higher work-life balance, this may indicate that these faculty members may balance work and life differently than those in teaching focused universities. While faculty report higher work-life balance outcomes in research focused universities generally, this study finds that those in marriage-like relationships and with dependent care report lower work-life balance. Faculty members in research focused universities may experience conflict from factors outside of work. Today, familial responsibilities are no longer the sole responsibility of women. Male and female faculty members may want to be actively involved and present with their friends and family. Historically, universities developed out of a gendered environment where the majority of students and faculty were men. Within these masculine gendered university settings came the expectation that assistance for home and familial obligations would come from someone outside of the work environment. While work-life balance in research focused universities may generally be higher in research focused universities, the findings of this study also signify a masculine cultured work environment with long held cultured expectations that a faculty member would have someone outside to assist with home and familial responsibilities.

This study finds that STEM faculty report significantly lower levels of sense of belonging in research focused universities. Research on sense of belonging is often an area of focus for K-12 levels and for undergraduate students (Hurtado & Carter, 1997; Hausmann, Schofield, & Woods, 2007; Slaten et al., 2017). Sense of belonging for university students is argued to be a result of social and academic integration, where feelings of being cared for and appreciated come from faculty and staff within a university (Hausmann et al., 2007; Slaten et al., 2017). Generally, sense of belonging is a direct result of meaningful interpersonal interactions (Alderfer, 1972; Ivancevich & Matteson, 2002). Research focused universities are considered to be highly competitive and rigorous when compared to teaching focused universities. When considering the gendered institution of academia, these research focused universities exhibit high power differences and well-established historical practice for retention and promotion. When considering university type differences, research focused universities are considered to be the most elite and evaluation metrics have been a function of long held traditional metrics of publications. These traditional long-held processes, practices, images and power differences of universities may be influencing faculty member’s sense of belonging. Due to the competitive aspects of research focused universities, faculty members may be less interested in focusing on aspects of psychological outcomes such as sense of belonging and may focus their relationships with others to achieve more research focused outputs.

Self-efficacy for faculty in research universities can be defined as confidence in conducting research while also being able to manage teaching and managing service workload (Ismayilova & Klassen, 2019; Sykes, 2006). This study finds that STEM faculty in research focused universities report significantly lower levels of self-efficacy. Previous research finds that teaching load and administrative workload can influence self-efficacy for faculty in research focused universities (Ismayilova & Klassen, 2019). Retention and promotion opportunities in research focused universities are focused far more on publication and funding than teaching and service work. Research focused universities are gendered with more masculine characteristics such as competitiveness. STEM faculty in research focused universities may feel that they are unable to focus upon producing publications which are directly attributed to higher evaluative expectations when compared to due to less competitive aspects of academic work such as teaching and service work. Faculty may therefore report lower levels of confidence in their ability to produce adequate publications needed to be successful in research focused universities.

Female faculty

Following current literature on gender differences within organizations, this study assumes that female STEM faculty, compared to male STEM faculty will report lower levels of psychosocial outcomes. The results show that female STEM faculty report significantly lower levels of work-life balance across both research and teaching focused universities. This finding confirms previous literature that finds that STEM faculty experience issues with work-life balance (Etzkowitz et al., 2000; Smart & Fox, 2008). There are various reasons why female STEM faculty experience lower levels of work-life balance, including the fact that women still provide a majority of the household and childcare responsibilities (Mason et al., 2012). While many research universities have family-friendly policies, the organizational culture within a university or department may influence the effective utilization of the policies (Feeney & Stritch, 2019; Wyatt-Nichol, 2017). When considering gender differences, a long-held aspect of an organizational setting is that women are disadvantaged due to the stereotypical belief that they will inevitably be the one to have more non-work distractions than men (Acker, 1992; Budig, 2002). The findings in this study illustrate these gendered institutional processes, practices, and images where women are assumed to deal with traditional gender norms and expectations about roles both at work and at home.

I do not find any significant differences in STEM faculty's sense of belonging and self-efficacy, by gender. The finding for sense of belonging and self-efficacy contrasts with previous literature on women in STEM (Ismayilova & Klassen, 2019; Johnson, 2012). Sense of belonging is considered a strong factor for STEM faculty's success and retention (Dasgupta, 2011; Walton & Cohen, 2011). Previous research finds that over time, female STEM faculty can change their initial sense of belonging and either choose to stay or leave their departments (Smith, Lewis, Hawthorne, & Hodges, 2012). The gendered environment of STEM is a result of the educational system. Images of men in positions of power and their representation within STEM fields from textbooks and in the classrooms have led to long held beliefs that women are discriminated against or unwelcome STEM fields (Good et al., 2010). The findings in this study do not support the view that female STEM faculty feel less included in STEM fields. This finding may be an indication that the academic workplace for women has gotten better or that female faculty may choose to leave when they feel that they do not belong or when they have a lower sense of self-efficacy. As this study uses data from one point in time, future research should investigate if sense of belonging and self-efficacy vary by gender over time or if sense of belonging and self-efficacy are a function of self-selection – those who don't have a sense of belonging and low self-efficacy exit the system prior to getting tenure track jobs.

Informal networks

Feminist theory argues that women are expected to be good at understanding the feelings and emotions of others. Additionally, relational demography states that individuals that exhibit similar demographic characteristics are more likely to develop work groups (Cohen & Broschak, 2013). This study assumes that the proportion of women in informal networks will increase psychosocial outcomes for STEM faculty due to gendered stereotypes that women provide the majority of emotional support generally. Overall, I do not find support for this. Rather I find that a higher proportion of women in informal networks can decrease psychosocial outcomes for women but improve some psychosocial outcomes for men. I find that support from informal networks varies depending upon network type. Instrumental networks provide information on job-related resources while expressive networks provide social support and friendship (Ibarra, 1993;

Ibarra & Andrews, 1993). STEM departments are associated as being highly gendered with a increased likelihood of underrepresentation of female faculty and perpetuation of masculine work environments. Female STEM faculty may not provide emotional support in their departments, as these male-dominated departments may have a masculine based culture where these supportive conversations or relationships may not be supported. These findings may also indicate that as female STEM faculty entered the STEM "pipeline", they became accustomed to the masculine characteristics and culture of the field. Unfortunately, this finding may also be supporting previous research which argues that female STEM faculty may be less willing to provide guidance and support to other women (Etzkowitz et al., 2000), as they received limited information and support from women as they progressed in their positions.

Work-life balance

There are no significant findings for STEM faculty's work-life balance as related to the proportion of women in their productivity networks. A high proportion of women in instrumental networks (e.g. productivity networks) may not provide the necessary support for work-life balance outcomes. Previous research finds that both men and women are more likely to develop mixed networks for productivity outcomes (Blau, 1994). Work-life balance is not necessarily associated with productivity outcomes such as publications. Achieving information and knowledge in how to obtain work-life balance will most likely include individuals who can provide more than job-related resources and will instead include a mix of resources that is both useful at home and at the job.

When considering expressive networks, male STEM faculty with a high proportion of women in their support networks report lower levels of work-life balance in teaching focused universities. This finding is unexpected when considering social network theory and gendered theory, as both men and women are more likely to include more women in their support networks (Martin, 1999; Xu & Martin, 2011). The finding of this study may support the view that men place less of a value on collegiality and positive interactions than women (Berstein & Russo, 2008). Male STEM faculty may not rely upon women in their support networks as they may face their own unique difficulties based on their gender with obtaining work-life balance.

When looking at advice networks, another expressive network this study finds that STEM faculty with a higher proportion of women in their advice network report significantly lower levels of work-life balance. This finding is true for both male and female STEM faculty in research focused universities. While advice networks provide access to information regarding department and relational concerns, this study doesn't measure the accuracy or usefulness of the information obtained from individuals in the advice network. It may also be that seeking more information leads to issues of information asymmetry over time and will provide little support for work-life balance concerns to STEM faculty in research universities. Historically, research focused universities had the expectation that the majority of the faculty would be men, with primary work rather home and familial responsibilities. The results of this study may be a result of the success or failure of family-friendly policies and initiatives within certain universities and departments. This study does not have information on department or university initiatives which may influence the types of advice that women may provide to faculty members. For example, advice regarding work-life balance for faculty members may be dependent upon the information and resources provided by the department and/or the university. Therefore, if there are no work-life balance initiatives, it may not matter the number of women in the advice network.

Sense of belonging

STEM faculty rely on their productivity networks for career growth in the academy (Bozeman & Corley, 2004; Gaughan & Bozeman, 2016; Gaughen et al., 2018). Productivity networks allow STEM faculty to receive information and knowledge on job-related items (Ibarra, 1993). I find that STEM faculty in research universities report significantly higher sense of belonging when there is a higher proportion of women in their productivity networks. Research that focuses on the productivity outcomes of STEM faculty finds that female faculty are now publishing at similar rates as men and in many cases publish in higher impact journals (Duch, et al., 2012; van Arensbergen et al., 2012). This finding may be a result of STEM faculty focusing on productivity outcomes collectively within their department, which may lead to greater feelings of a sense of belonging. Traditionally held gendered norms that argue that STEM disciplines should be male-dominated and that women are weak in STEM skillsets (Banchefsky et al., 2016; Lee, 2008) may be of no importance to STEM faculty when considering productivity outcomes. An instrumental network, regardless of gender, may be far more influential when the focus is on a shared productivity outcome such as publications or research grants.

Regardless of the type of support provided to female STEM faculty, women are more likely to have women in their support networks (Brands, 2013; Feeney & Bernal, 2010). Because women are expected to provide the emotional support (Brands, 2013), it is expected that a proportion of women in networks will be more likely to provide more social support (Ibarra, 1993). I find that female STEM faculty in research focused universities report a lower sense of belonging when there is a large proportion of women in their support networks. Due to the gendered environment of research focused universities, expressive networks such as those providing support may not be helpful in female faculty members having a higher sense of belonging. Female faculty members may believe that support in the form of reviewing papers and proposals may not be helpful when coming from other women. This finding may be related to the expectation that instrumental networks with more men in it would be far more beneficial to fit into the competitive and rigorous environment in research focused universities. Social Identity Theory argues that in-group and out-group effects dictate the views on one's self (Tsui et al., 2002). Men in universities and in STEM departments are more likely to be in higher ranks, to be considered to be more influential in the field, to be represented more, and to have higher salaries. It may be that female faculty members perceive that in order to belong in their STEM department, which is considered to be masculine, they need less women to provide support as opposed to men; as the predominately most influential in-group gender in STEM is male. This finding may be a result of women providing negative feedback after reviewing papers and proposals in the department.

Previous research finds that both male and female STEM faculty report the presence of more women in their advice networks (Feeney & Bernal, 2010; Gaughan et al., 2018). The results of this study find that male STEM faculty with a higher proportion of women in their advice networks report a higher sense of belonging in research focused universities. I do not find that sense of belonging is related to gendered network composition for female STEM faculty. Male STEM faculty may be reporting a higher sense of belonging when they have a high proportion of women in their advice networks because the women in the network are able to provide advice regarding departmental culture dynamics and personal matters. Men frequently cast women as confidants for emotional support (Martin, 1999). Women not only are expected to but obligated to provide caring and nurturing support it is likely that men assume that their presence provides the expressive support they look for when considering departmental and personal matters. Male STEM faculty may feel that having a network that provides emotionally supportive advice makes them closer to the individuals that they turn to and therefore increases the sense of belonging in the department.

Self-efficacy

I find that female STEM faculty with a proportion of women in their productivity network report lower levels of self-efficacy in research universities. Female STEM faculty may believe that they do not have individuals in their productivity networks that provide substantial productivity resources. Since women are more likely to provide aspects of emotional support, this expressive nature may not be beneficial for outcomes such as publication and grant getting for female STEM faculty. Instrumental networks are argued to be better suited for women when there are a mix of men and women (Ibarra, 1993). Gaughan et al. (2018) finds that female STEM faculty have fewer instrumental resources in their networks generally. The findings in this study may be a factor of female STEM faculty having too many women in their productivity networks which may negatively influence their beliefs of success in a highly competitive and masculine orientated university. The findings may also signify that even when female STEM faculty have more women in their productivity networks these women do not have the resources necessary to for them to feeling higher level of self-efficacy in their department.

I find that STEM faculty in both research and teaching focused universities report higher levels of self-efficacy when there is a high proportion of women in their support networks. In particular, the results of this study find that female STEM faculty in research and teaching focused universities with a higher proportion of women in their support networks report higher levels of self-efficacy. This finding also holds true for male STEM faculty in teaching focused universities. Feminist theory and social network theory argues that expressive networks, or networks where support is given, will most likely come from women as this is an expected gendered characteristic. Based upon gendered practices and images, STEM faculty regardless of university setting would be more inclined to assume that turning to women would allow them to receive higher levels of emotional support and understanding. These caring and encouraging characteristics associated with emotional labor would therefore lead to STEM faculty to feel better about one's abilities when there are a higher proportion of women in the support networks.

Another example of expressive networks for female STEM faculty are the advice networks. I find that female STEM faculty in teaching focused universities with a high proportion of women in their advice networks report significantly lower levels of self-efficacy. Based upon previous research in higher education, women are represented much more in teaching focused universities than research focused universities. The findings of this study may be directly related to these demographic differences. In teaching universities, which are considered to be dominated by women much more, may not be a work environment where female STEM faculty feel that they obtain better advice from more women as these may be resources that she may be able to obtain on her own.

Control variables

This next section focuses on five control variables: associate professor, salary, publications, teaching course load, and friends. I only discuss the control variables with significant results across the three models. Following the previous section, I present results from the work-life balance model first, then I present results from the sense of belonging model, and finally I discuss the controls from the self-efficacy model. I end this section with a general overview of departmental differences across the models and how these align with gendered expectations of the field.

First, STEM faculty that are associate professors within teaching focused universities report lower levels of work-life balance. This is likely due to increased service responsibilities that are assigned to faculty as they get promoted to higher ranks. In particular, I find that male STEM faculty that are associate professors in teaching focused universities report lower levels of work-life balance. Feminist theory argues that long held gendered stereotypes and beliefs are present for both men and women. Generally, men are still believed to provide far less family and home support than women (Budig, 2002). When male STEM faculty are assigned more roles as they attain higher ranks department chairs and/or committees are assuming that male STEM faculty have less responsibilities outside of work which may lead to male STEM faculty reporting lower levels of work-life balance.

Additionally, female STEM faculty that are associate professors in research focused universities report lower levels of work-life balance. This may be combination of increased service work and the expectation that female STEM faculty are often more likely to have lower work-life balance based upon personal responsibilities. One reason female STEM faculty that are associate professors may be reporting lower levels of work-life balance at research focused universities is attributed to the increased teaching and service roles that are put on women (Bailyn, 2003; Carrigan et al., 2011). Once female STEM faculty members are associate professors, they are likely tenured and are assumed to be able to take extra service responsibilities. Research on gendered differences finds that while men are now providing more home and familial support, women are still providing the majority of home and familial responsibilities (Mason et al., 2012; Salle et al., 2016). Female STEM faculty may report lower levels of work-life balance as they are more likely juggling work expectations with home and family responsibilities.

Second, STEM faculty report that higher salary influences their sense of belonging and self-efficacy. While I do not find that higher salary influences work-life balance, this may be attributed to STEM disciplines. Compared to non-STEM positions, STEM jobs are higher in salary and prestige (Correll, 2001; Piehero et al., 2017). The higher salary for STEM faculty may serve to alleviate stressors from personal and family lives and thus equalizes work-life balance issues across men and women. STEM faculty in research focused universities report that higher salary increases view on their sense of belonging. It’s possible that a higher salary enables faculty to feel valued in their department. Research focused universities are considered to be more prestigious than teaching focused universities and these power differentials may be a reason why STEM faculty feel that they are valued more when receiving higher salary in research focused universities. A work environment that rewards skillsets and performance may influence beliefs of self-efficacy (Ismayilova & Klassen, 2017). Male and female STEM faculty across research and teaching focused universities report higher levels of self-efficacy when they have higher salaries. This may be because STEM faculty that report that receive higher salaries believe that their department and university value their skillset and academic performance.

Publications are key promotion metrics for STEM faculty at research universities. The results of this study support this view from previous literature (Gaughan & Bozeman, 2016). STEM faculty in research focused universities with more publications are significantly more likely to indicate that they have higher work-life balance. This is most likely attributed to faculty member’s beliefs that producing more publications indicates that they are managing their work and home life successfully, or at the very least reaching their professional goals. While teaching focused universities base promotions primarily upon teaching outcomes, faculty are still expected to produce publications. This study finds that female STEM faculty in teaching focused universities with more publications indicate higher levels of work-life balance. While research on publication differences for STEM faculty in teaching universities is limited, these findings indicate that female STEM faculty producing more publications report better management of their home life and teaching expectations. Again, this may be the result of WLB being tied to professional success. Female STEM faculty in teaching focused universities in this study are more likely to indicate a higher sense of belonging when they have more publications. This is in direct contrast to male STEM faculty in teaching universities, which report that they have lower sense of belonging when they have more publications. Male STEM faculty may feel that expectations in teaching focused universities for promotion purposes is placed more on work outside of publications and therefore believe that they do not belong if they are producing more publications. Alternatively, female STEM faculty may feel that their ability to publish more while also completing all other teaching expectations may lead them to feel that they belong in their academic roles. Future research should investigate further within departmental culture for teaching focused universities and views upon publications. An unexpected result in this study was that male STEM faculty in research universities report lower levels of self-efficacy when they produce more publications. This is in direct contrast with previous research on STEM faculty and self-efficacy outcomes as they relate to performance outcomes (Cummings & Kiesler, 2007; Gaughan & Boozeman, 2016; Kyvik & Teigen, 1996). One possible explanation may be that, when comparing themselves to other colleagues within their department, male STEM faculty may feel that they are not producing a comparable amount of publications or publishing research in as prestigious of journals as their colleagues. Future research should investigate if differences exist amongst colleagues in the department to better understand this finding. The results of this study find that both male and female STEM faculty with more publications report lower levels of self-efficacy. STEM faculty in teaching focused universities allocate more time to teaching and service activities (Bellas & Toutkoushian, 1999). Therefore, this finding seems to be a factor of how STEM faculty have lower self-efficacy when publications are not the main focus of time.

Finally, this study finds that STEM faculty with friends in their departments report higher levels of work-life balance and self-efficacy. These individuals provide instrumental support for faculty to achieve general feelings of well-being and work-life balance (Annink, 2017; Feeney & Bernal, 2010; Gaughan et al., 2018). STEM faculty in research and teaching focused universities report higher levels of work-life balance when they have more friends in the department. This finding matches previous literature that finds that friendships provide faculty members the opportunity to provide them with social support (Annink, 2017). Female STEM faculty in teaching focused universities report lower levels of sense of belonging when they have more friends. This finding contradicts previous literature on friendship and the benefit of friendships within instrumental networks. Previous research on women in STEM finds high levels of turnover due to gendered issues within departments and universities (Fox 2005; 2010). Male STEM faculty in research focused universities report higher levels of self-efficacy when they have more friendship ties. This finding may exist for two reasons: 1) friendship ties within departments increase the level of confidence and belief that one belongs within a work-setting (Siciliano et al., 2018); 2) Gendered perspectives of STEM faculty is geared towards masculine expectations and therefore men are more likely to develop friendship ties more so than women in STEM disciplines.

Research on gendered differences in STEM fields finds that women are more likely to be in departments such as biochemistry and biology than in mathematics and civil engineering (Matskewich & Cheryan, 2016; Su & Rounds, 2015). Work-life balance is assumed to be lower for women than for men, as the majority of the home and familial responsibilities are assumed to primarily be women's work (Connell, 2006). When considering the representation of women by field, the findings of this study support these gendered expectations of work-life balance constraints. In fields where there is higher women's representation, both men and women faculty report lower work-life balance as compared to faculty in male dominated disciplines (e.g. math and engineering). These results may be a function of gendered expectations. Female STEM faculty may be providing the majority of the outside work responsibilities and therefore may be reporting lower levels of work-life balance. This gendered assumption that women provide the majority of home and life responsibilities may also be a reason that male STEM faculty report lower levels of work-life balance in fields with a high representation of women. Male STEM faculty may recognize in departments where they are numerically underrepresented that they balance their home and life responsibilities at the same level as their female STEM colleagues.

When looking outcomes related to sense of belonging for STEM faculty across disciplines, findings are mixed. The findings for sense of belonging in this study support the gendered nature of the field. Male STEM faculty in this study report lower levels of sense of belonging in fields predominately dominated by women (e.g. – biochemistry and biology) when compared to those dominated by men. Since biochemistry and biology have higher proportions of women, male STEM faculty may feel that they are not part of in-group or no longer the dominant group (Tsui et al., 2002). Related, female STEM faculty in research focused universities report higher sense of belonging in biology. As women are more likely to be represented in this field, female STEM faculty may be attributing that they belong due to the in-group characteristics. While the presence of women in the field may explain the results for biochemistry and biology, this study unexpectedly finds that male STEM faculty in civil engineering report lower levels of sense of belonging as well. Sense of belonging is associated with friendly interactions amongst people (Ivancevich & Matteson, 2005). Since civil engineering is considered one of the most rigorous engineering disciplines, it may be that male STEM faculty feel increased levels of competition with peers in their department and therefore report lower levels of sense of belonging. Surprisingly female STEM faculty report higher levels of sense of belonging in civil engineering disciplines in research focused universities. This finding may be attributed to self-selection or social identity theory and how female STEM faculty in these STEM departments define themselves. It is possible that female STEM faculty that have successfully entered into these male-dominated fields, which are often characterized as the most difficult to be a part of (Blickenstaff, 2005; Ma, 2011), may feel a high sense of affiliation and sense of belonging with their colleagues because of this achievement (Tajfel & Turner, 1979).

Self-efficacy is defined as one's belief of their capabilities to be successful (Bandura, 1977). Male STEM faculty in this study report higher levels of self-efficacy, and female STEM faculty report lower levels of self-efficacy, regardless of field. STEM fields are assumed to be masculine and long held gendered norms argue that men are more likely to be present in STEM than women (Blickenstaff, 2005; Leslie et al., 2015). The findings of this study may be a direct result of long held gendered norms that men, compared to women, are more likely to be present in STEM disciplines. Gendered practices, images, and power differentials may be a reason for this finding. The representation of women in STEM compared to the social sciences, images of male scientists in textbooks, and the pay differences between men and women may indicate why some women report lower levels of self-efficacy. Female STEM faculty may be more likely to report lower levels of self-efficacy, as they are also aware of the lack of representation of women across STEM fields both in the workplace and in the classroom.

Summary

This study provides a comprehensive overview of the types of psychosocial outcomes in higher education as a result of university mission, gender differences of faculty members, and with networks with a high proportion of women. This study combines theoretical frameworks on gendered institutions, feminist theory, relational demography, and social capital. The results of this study find that psychosocial outcomes do in fact differ based upon university type. With the exception of work-life balance, STEM faculty in research focused universities report lower levels of sense of belonging and self-efficacy. Sense of belonging and self-efficacy do not differ substantially for female STEM faculty. Finally, STEM faculty with a high proportion of women report lower psychosocial outcomes across university types. The results of this study find that female STEM faculty that surround themselves with a large proportion of women in their productivity, support, and advice networks experience decreased psychosocial outcomes, while men experience some increased psychosocial outcomes.

Theoretical Limitations and Contributions

Before presenting the contributions of this study, I discuss the theoretical limitations. Data and methodological limitations were discussed in the previous chapter.

Based on feminist theory, this study assumed that STEM faculty would turn to more female faculty for emotional support and therefore more women in networks would lead to faculty reporting higher work-life balance, sense of belonging, and self-efficacy in their department. However, it is possible that STEM faculty could turn to both male and female faculty for emotional support. While this study follows previous research that highlights the gendered differences within STEM and across organizations in attributing emotional support to women (Meier et al., 2015), a limitation of this study is that it does not take into account the types of emotional support that men could provide to their colleagues.

A theoretical limitation of this study is the generalizability of the study. This study focuses on four STEM disciplines. Outcomes as they relate to work-life balance, sense of belonging, and self-efficacy in the four STEM departments (biochemistry, biology, mathematics, and civil engineering) may differ from other STEM disciplines. For example, across engineering disciplines civil engineering is considered to be one of the most male dominated when compared to other types of engineering disciplines (Ma, 2011). Additionally, the four STEM departments of focus in this study may differ in their gendered representation and focus of work-life balance, sense of belonging, and self-efficacy when compared to social science disciplines. In particular, there may be substantial gendered differences when comparing biology to a field such as women's studies. Future research should compare if work-life balance, sense of belonging, and self-efficacy differs based upon other STEM fields and other social sciences in order to get a clearer understanding of how the proportion of women in informal networks may influence these outcomes.

This study offers contributions to higher education research and human relations literature. First, with the exception of Pinheiro, Melkers, & Newton (2017) relatively little research focuses upon faculty differences by university type. This study expands current literature regarding social networks of STEM faculty by investigating psychosocial outcomes for faculty at both research and teaching focused universities. If higher education scholars wish to understand outcomes related to university settings, then it is fundamental to understand the perceptions from faculty within all university types.

Previous studies have suggested the importance of investigating how emotional support may impact psychosocial outcomes (Guy & Newman, 2006; Meier et al., 2015). Many studies assume that emotional labor is provided by women (Guy & Newman, 2006; Guy, Newman, & Mastracci, 2014; Meier et al., 2015) and finds that women are able to provide lower turnover and higher organizational performance. While women are assumed to provide more nurturing and caring characteristics these expectations may not translate when considering gendered networks. Research on gendered networks finds that when considering instrumental outcomes, more women in these instrumental networks can lead to less resources and lower performance outcomes within organizations (Ibarra, 1992; 1993). The findings of this study provide mixed support on previous research on gendered networks. This study confirms that a high proportion of women in instrumental networks can lead to lower outcomes for STEM faculty. Yet, the findings for this study also find that expressive networks, in the form of advice and support networks, can provide on average lower psychosocial outcomes for female STEM faculty but higher psychosocial outcomes for male STEM faculty. These findings may indicate that while feminist theory argues that more women being represented across organizational settings is better for other women, it may in fact only prove to benefit men when in a male-dominated work environment. When considering the masculine cultured field of STEM, unfortunately women's steady growth in these fields has not removed strongly held gendered beliefs that instrumental networks are best with less women than more. Additionally, it may be that the gendered differences across STEM fields may also influence how women choose to view their field and who they turn to include in their expressive networks. The findings of this study show that male STEM faculty benefit most when considering who to turn to for emotional support in their department for psychosocial outcomes, which supports literature on the overall gendered expectation that men are more likely to turn to women for caring and nurturing advice and support.

Figure 4. Theoretical Model Overview

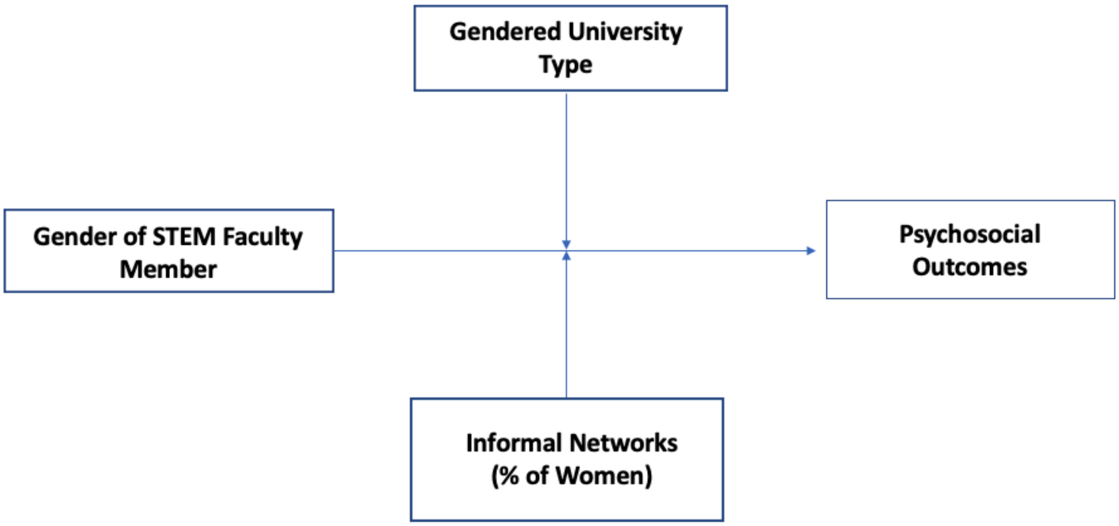


Figure 4 reintroduces my theoretical model from chapter 2. The theoretical model proposed that STEM faculty (men/women), their level of gender representation (percent women) in informal group networks (productivity, advice, and support) influenced perceived psychosocial outcomes for STEM faculty across two university types (research/teaching). At the start of the study, I began with a quote regarding gender and perceived emotional labor ties based on gender. This study looks at how emotional support may be provided by informal networks, or a network comprised of female STEM faculty within universities.

The findings of this study provide insight into the underlying gendered perspective of what women are assumed to provide in the workplace. This long-held perspective that women need to or are expected to provide emotional labor and support is not significant in improving psychosocial outcomes. Previous research on professional outcomes for individuals with networks that have a high presence of women find that women are negatively impacted (Ibarra 1992; 1993; McPherson & Lovin, 2002). This study finds that similar findings exist for psychosocial outcomes when looking at these instrumental networks and their gender make-up. While a higher proportion of women in networks is beneficial for men, department and universities will need to consider in what ways they are better able to increase work-life balance, sense of belonging, and self-efficacy outcomes for all STEM faculty. Underlying department or organizational expectations based on feminist theory that female STEM faculty are more likely to provide the majority of the emotional support is only support for male STEM faculty. As departments and universities seek to attract and retain women, it is apparent that in order for all STEM faculty to achieve higher levels of work-life balance, sense of belonging, and self-efficacy, departments and universities should think of other ways outside of departmental relationships to increase these psychosocial outcomes.

Implications for Practice and Policy

This study provides practical implications for universities and scientists. At the individual level, STEM faculty should be cognizant of the types of resources that informal networks can provide for work-life balance, sense of belonging, and self-efficacy outcomes. The results of this study find that STEM faculty with a high proportion of women in the advice networks report less work-life balance. Previous research finds that a high proportion of women is necessary for leadership opportunities (Uzzi et al., 2000). Female STEM faculty may need to change how they form their networks based upon the types of outcomes that they are interested in achieving. While women may be more likely to have similar work-life balance constraints, it does not necessarily provide information to improve psychosocial outcomes in the workplace as they pertain to work-life balance, sense of belonging, and self-efficacy. In fact, assuming that women offer more emotional support does not necessarily translate into that support happening.

This study finds that STEM faculty across universities report higher levels of self-efficacy when there is a higher proportion of women in their support networks. Previous research finds that women provide support through reviewing papers and proposals (Feeney & Bernal, 2010). This support from women may help with overall productivity outcomes which lead to higher self-efficacy – and potentially more publications which is related to reducing gender differences in self-efficacy reports.

This study finds that regardless of STEM discipline and the gender of faculty, STEM faculty report lower levels of work-life balance. Based upon this, STEM departments and universities should consider adding family-friendly policies and initiatives that can benefit both men and women. The historical and traditional gendered norms on both men and women and the responsibilities that each has both at work and at home needs to be reconsidered to what today's realities look like regardless of STEM discipline or university type. Additionally, the findings of this study show that female STEM faculty are more likely to report lower levels of self-efficacy while male STEM faculty report higher levels of self-efficacy. It may be beneficial for STEM faculty, both men and women, to consider how best to increase their student's views of self-efficacy. Research on gendered differences in STEM argues that from an early age and throughout education experience women are conditioned through classroom practices and images that STEM is best suited for men (Blickenstaff, 2005). STEM departments should consider how to develop inclusive policies not just for their students but their faculty as well.

Opportunities for Future Research

In this section I provide suggestions for future research relevant to higher education, gendered theory, and public management scholarship.

First, current research in higher education focuses primarily on the workforce and work environment of research universities. Research universities provide ample opportunity to investigate many factors that may be associated with awarding National Science Foundation, state, and federal grants in higher education. Additionally, collaborations amongst faculty within research universities has been a large focus in current research (Siciliano et al., 2018). Future studies should closely view how faculty within teaching focused university develop collaborations amongst other faculty and the greater community in obtaining teaching objectives tied to higher education. While research and teaching focused universities encompass a variety of universities, future research should look at psychosocial differences for STEM faculty within different teaching universities types. For instance, historically black college universities and women's colleges may be much more closely related, or they may differ widely in faculty's view on psychosocial outcomes when compared to liberal arts colleges or master's colleges. Research on minority faculty, find that institutions that are designated as historically black colleges universities and Hispanic focused universities are far more aligned with developing and empowering minority faculty members than those that are not (Gonzalez et al., 2013). Another example would be Women's colleges, where faculty may also be more aware of gendered concerns and therefore may provide a higher emphasis on items such as work-life balance, sense of belonging, and self-efficacy.

Second, as implicated in the theoretical limitations section this study does not take into account factors associated with intersectionality. Intersectionality captures the interconnected social forces as it relates to an individual person. Crenshaw (1989; 1997) originally introduced the term to highlight that individuals are not only defined by their gender, race, class, or nationality. Rather intersectionality encompasses the interwoven nature of an individual, where perspectives of a white woman may differ considerably from a woman of color. These individualized experiences based upon gender, race, class, nationality can produce varying view of the social environment (Crenshaw, 1989). While this study controls for underrepresented minorities, it does not account for faculty that may approach views of the workplace or relationships with a different perspective based upon their intersectional perspectives. Future research should develop a larger understanding of psychosocial outcomes for faculty by gender, race, generation, class, and cohort perspectives. This study focused primarily on gender and results from this study produce questions regarding potential generational differences on views of the workplace for older and younger female faculty. Previous research argues that older female faculty may feel that the younger generation of faculty experience fewer organizational barriers (Etzkowitz et al., 2000). This may also hold true for minorities whose presence is steadily increasing across academia (NSF, 2018). Female faculty may not be the only area in which faculty may turn to for emotional support. Feminist theories argue that traits associated as masculine and feminine are not solely binary by sex. While historically emotional support was initially argued for reasons to incorporate women in the workplace (Kanter, 1977), men are also able to provide caring and nurturing support. Future research should use network studies to investigate how many men are considered to provide emotional support to faculty members.

Third, with regards to public management, this study provides some explanation into how informal networks may influence work-life balance, sense of belonging, and self-efficacy outcomes within organizations. Human relations are a key focus of organizational behavior within public management. This study exemplifies some ways in which relationships amongst colleagues can impact personal psychosocial outcomes. Public administration is argued to be masculine gendered through very similar processes, practices, images, and power differentials that are present in universities (Stivers, 1990; 1992). Local, state, and federal government is often considered to be male dominated with a lack of women being represented amongst management roles (Feeney & Camarena, 2019; Riccucci, 2009). Public management scholars are increasingly interested in ways in which organizations attract, retain, and promote individuals in the workforce (Moynihan & Pandey, 2008; Paarlberg & Lavigna, 2010; Thomas & Davies, 2002). Based upon this study it appears that men benefit from more women in their informal networks when looking at STEM departments and across universities. The question is do men in public administration experience the same benefits and how can informal networks help women in public management? Factors related to the organizational structure, gender, and individual networks may provide further insight into organizational behavior outcomes as it pertains to gendered views in public management.

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APPENDIX A

PROTOCOL FOR BIBLIOMETRIC DATA COLLECTION

1. Go to the Web of Science database
    a. Choose “Advanced search”
    b. **UNCHECK** the boxes next to “Arts & Humanities Citation Index” and “Social Sciences Citation Index”
    c. **You should ONLY search within the “Science citation index”**
    d. Click on “Author Index” (right underneath the search form)
        i. Type the surname (last name) of the respondent followed by **his first initial**, and click “move to”
        ii. You will be given a list of possible matches, consisting of the surname you entered and various combinations of first and middle initials
        iii. You should ONLY select **TWO of these possibilities**, which are usually on the close to the top of the list. Select the following TWO:
            1. surname + first initial, without any additions
            2. surname + first initial + middle initial
                a. You should have been able to retrieve the middle initial of the respondent from his or her CV
        iv. Click the ADD button next to EACH of these TWO entries
            1. **NB: it is VERY important that you select BOTH of these name variations**. Option 2 (surname + first initial + middle initial) is NOT a perfect subset of Option 1 (surname+first initial), thus omitting 2 in many cases will result in cutting off publications that legitimately belong to the respondent in question.
        v. Then click OK at the bottom of the page (where it says **“Transfer your selected author(s) below to the Author field on the search page.**)This will take you back to the search form
        vi. Look at the respondent’s CV and find the year they received their PhD degree.
        vii. Subtract 6 from this number, and use the resulting year as the start of the period for which to perform search of publications. You select the years for which to search from the drop-down menus on the upper right
            1. The purpose of delimiting the search in this way is to help weed out publications of people with the same name like the respondent. This is especially helpful if the respondent is a recent PhD. **NOTE:** if the resulting year is less than the

lowest year available (i.e. currently 1987), use the lowest year available, since obviously you cannot search for earlier years.

viii. Click the "Search" button next to the query form

e. The search you just performed will appear on the top of your "search history" – the list in the bottom of the page. This list shows you how many articles the search you just order resulted in.

    i. These searches are remembered temporarily, which is useful if some temporary malfunction happens.

f. Click the number of articles. This will give you the list of articles you found based on these general criteria. Now you need to refine your search results (although occasionally you might get lucky and find everything you need just by name). Even if you do get lucky, you still need to go through the steps below.

g. Just above your search results, you will see a blue stripe saying "Refine your results". Click the "more choices" link on the far right.

h. Then, click the "Institutions" link. NB: narrowing the search by institution is the single step of the search that involves judgment calls. Be **EXTRA careful** on this step

    i. Click on "Institutions".

    ii. You will see a list of institutions linked to the papers you just found. If the list is very long, at the right bottom corner, there will be a "view more" button. **Click it, so you see the full list of institutions.**

    iii. Now, using the respondent's CV as a reference, go through this list and find EVERY institution in which the respondent has RECEIVED THEIR PHD DEGREE, AND – MOST IMPORTANTLY - WORKED. The most reliable way to do this is by going through the list line by line. This is a time consuming task, and take as much time to make sure you have carefully checked the institutions list. You may combine looking through the list with searching for keywords from the institutions names by using the "find on this page" browser function. However, you should NEVER rely on the search function alone.

    iv. To make things mire unpleasant, WOS lists institutions NOT in alphabetical order, but by number of publications associated with each institutions, in descending order.

        1. most respondents will have worked only in universities, however, some will list **industry or governmental**

organizations. Since many industry and government scientists publish as well, **you must find these institutions on the list as well.**

v. <u>VERY IMPORTANT</u>: the institution names in Web of Science are **NOT standardized.** The SAME institution will appear under MANY slightly different names. That's why it is very important that you inspect the entire list and check on any instance of an institution name that corresponds to an institution in which the respondent has either worked or studied.

i. After you have checked all institutions that appear on the respondent's CV, click the "view records" button on the right. This is your final search result for this person.

j. The list will show the total number of articles found in the refined search. **Type that number in the "WOSpubs" column** on your spreadsheet.

   i. NB: ONLY do this if you are confident you found the right publications for the right person, see below

k. Eyeball the publications on the CV and the results you just got. Indicate if you notice any big discrepancy in the "comments" box.

   i. When "eyeballing" only consider journal publications after 1987, not conference papers or book chapters (because WOS does not cover most of them)

   ii. In general, the number of publications on the CV should always be roughly equal or greater than what you found on Web of science, because some journals are not covered in the database

   iii. If the number of papers you found in Web of Science is GREATER than what you see on the CV, you can be **virtually certain** that your search has picked some publications that do not belong to a particular respondent. Please go back to your search results and attempt to further refine by using university names.[1]

   iv. It is quite likely that there will often be a discrepancy of 1-2 articles between what you find on the CV and your search. In cases where the discrepancy is larger, it is very difficult to establish a formal criterion when is the match is "good enough". Consider the following examples:

[1] The only 2 scenarios in which your search could produce greater number of items and be correct are 1) the CV lists only selected publications, not all publications; 2) the respondent has a great number of editorial and review articles, which are not equal to peer review publications, but are covered in web of science. In most cases, however, greater number in the search than in the CV will mean error.

1. the CV has 125 publications, your results have 121 publications. This is an example of an excellent match, you can download your results and continue with no worries
2. the CV has 80 publications, your search has 68 publications. This can also be considered an ok match if you are getting this once in a while, but if you are getting such type of discrepancy often, you might be doing something wrong.
3. the CV has 25 publications, your search has 17 publications. In all likelihood, such result is fine as well, but be sure to take a look at the papers that do not match and make a note in the comments section (most of them could be conference proceedings that are not covered by web of science)
4. As a *general* rule of thumb, if your search results understate what you find on the CV by no more than 10%, you are probably fine. If it is more than that, in some cases it will also be fine, but you should take a more careful look at the CV and your results and try to identify a pattern that could explain the bigger discrepancy and note so in the comments
5. **IMPORTANT: in ALL** cases you run into a discrepancy, no matter how big or small, you MUST make a note of this discrepancy in the "comments field"
6. **Now you can enter the final number of publications in the WOSpubs column for this respondent**

v. NB: Once again, it is EXTREMELY IMPORTANT that you have selected all permutations of all universities and institutions in which a respondent has worked. If you miss one variation of a university's name, this will mean that you exclude some publications for this respondent.

vi. **NB: time consuming records:** inevitably, you will stumble upon records that are generally possible to filter out accurately, but this would require a lot of time and effort to complete. Since we are on a tight schedule, for now please skip such records.

   1. **whenever you encounter such a record, insert the following text in the "Comments" section:** "Ambiguous and/or time consuming". All the records you skipped MUST be labeled
   2. **As a general rule of thumb, you should NOT spend more than 20 minutes per record.** If it begins to take longer, simply skip it and insert the above text in the comments section

APPENDIX B

SURVEY QUESTIONNAIRE ITEMS

<u>Dependent Variables</u>

Work-life balance survey items

Please indicate the extent to which you agree with the following statements:
The demands of my work interfere with my home and family life
The amount of time my job takes up makes it difficult to fulfill family responsibilities
Things I want to do at home do not get done because of the demands my job puts on me
My job produces strain that makes it difficult to fulfill family duties
Due to work-related duties, I have to make changes to my plans for family activities

Response categories: 1=strongly disagree, 2= disagree, 3 = agree, 4 = strongly agree

Sense of belonging items

Please indicate the extent to which you agree with the following statements:
Faculty care about each other
Faculty treat each other with respect
Faculty know each other well
Faculty don't really know much about each other's research projects (REVERSE)
Faculty have little contact with each other (REVERSE)
Faculty compete for departmental resources (REVERSE)
Faculty are accessible to each other
Faculty put their own interests first (REVERSE)

Response categories: 1=strongly disagree, 2= disagree, 3 = agree, 4 = strongly agree

Self-efficacy items

To place your responses in context, we would like to know more about what you are like as a person. How much do you agree with each of the following statements about how you generally are now, not as you wish to be in the future.
I have a natural talent for influencing people
I take charge
I see myself as a good leader
I can talk others into doing things
I am good at making impromptu speeches
I don’t like to draw attention to myself (REVERSE)
I lack the talent for influencing people (REVERSE)
I keep in the background (REVERSE)
I find it difficult to manipulate others (REVERSE)
I have little to say (REVERSE)

Response categories: 1=strongly disagree, 2= disagree, 3 = agree, 4 = strongly agree

Control Measures

	NETWISE II Survey Question	Response Category
Course Load	During the past academic year, what was your teaching load?	Total #
Teaching Grants	Over the past five academic years, on average how many teaching or curriculum proposals (external and internal) have you submitted per year?	Total #
Research Grants	Over the past five academic years, on average how many research proposals have you submitted per year?	Total #

APPENDIX C

Z-SCORE WORK-LIFE BALANCE OLS MODEL

	Full Model		Research Universities						Teaching Universities					
			All		Men		Women		All		Men		Women	
	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE
Research University	0.07+	**(0.04)**												
Women	-0.30***	**(0.04)**	-0.30***	**(0.07)**					-0.30***	**(0.06)**				
% Women in Productivity Networks	-0.01	(0.10)	0.03	(0.16)	0.15	(0.25)	-0.09	(0.17)	-0.08	(0.08)	-0.01	(0.15)	-0.13	(0.11)
% of Women in Support Networks	-0.01	(0.48)	0.05	(0.68)	0.09	(0.75)	0.16	(0.40)	-0.17+	**(0.09)**	-0.16+	**(0.09)**	-0.03	(0.19)
% of Women in Advice Networks	-0.29*	**(0.00)**	-0.46**	**(0.18)**	-0.38+	**(0.22)**	-0.97***	**(0.12)**	0.25	(0.21)	0.33	(0.23)	0.06	(0.42)
% Women in Department	0.12	(0.17)	0.16	(0.28)	0.55	(0.45)	-0.45+	**(0.25)**	0.09	(0.20)	0.11	(0.36)	0.05	(0.12)
% Women Full Profs in University	-0.27	(0.37)	-0.58	(0.62)	-0.56	(0.54)	-0.3	(0.48)	0.36***	**(0.06)**	0.46*	**(0.19)**	0.48*	(0.23)
Faculty Department Size	-0.01	(0.01)	-0.01	(0.01)	-0.02***	**(0.00)**	0.01	(0.01)	0.004	(0.01)	0.00	(0.01)	0.01	(0.02)
Biochemistry	-0.13*	**(0.06)**	-0.08*	**(0.04)**	0.08	(0.06)	-0.47***	**(0.07)**	-0.08	(0.05)	-0.19**	**(0.06)**	0.12**	**(0.05)**
Biology	-0.25***	**(0.03)**	-0.22***	**(0.02)**	-0.23***	**(0.06)**	-0.10*	**(0.04)**	-0.25***	**(0.04)**	-0.29***	**(0.05)**	-0.10***	**(0.03)**
Civil Engineering	-0.20***	**(0.06)**	-0.14+	**(0.08)**	-0.01	(0.19)	-0.17*	**(0.08)**	0.001	(0.04)	0.04	(0.08)	-0.13+	(0.07)
Assistant Professor	-0.31+	**(0.17)**	-0.24	(0.20)	-0.31	(0.27)	-0.01	(0.16)	-0.35*	**(0.16)**	-0.47	(0.31)	-0.15	(0.22)
Associate Professor	-0.21	(0.18)	-0.13	(0.26)	-0.15	(0.32)	-0.01	(0.21)	-0.33***	**(0.05)**	-0.42***	**(0.08)**	-0.17	(0.16)
Marriage-Like Relationship	-0.21***	**(0.04)**	-0.33***	**(0.07)**	-0.32*	**(0.06)**	-0.48***	**(0.07)**	0.05	(0.04)	0.03	(0.13)	-0.03	(0.17)
Tenure Clock Change	-0.07	(0.10)	-0.05	(0.11)	0.06	(0.20)	-0.26**	**(0.09)**	-0.11	(0.11)	0.17	(0.26)	-0.33***	**(0.05)**
Dependent Care	-0.23**	**(0.09)**	-0.22+	**(0.13)**	-0.17	(0.24)	-0.12	(0.13)	-0.27***	**(0.06)**	-0.23**	**(0.07)**	-0.35**	**(0.11)**
Underrepresented Minority	-0.03	(0.15)	-0.12	(0.22)	-0.27	(0.26)	0.18*	**(0.08)**	0.2	(0.21)	0.12	(0.36)	0.19***	**(0.05)**
Log(Salary)	0.06	(0.31)	0.04	(0.42)	0.06	(0.57)	-0.07	(0.24)	-0.03	(0.23)	-0.13	(0.30)	0.17	(0.29)
Log(Bibliometric Publications)	0.06	(0.04)	0.12+	**(0.06)**	0.17	(0.10)	-0.01	(0.07)	0.002	(0.06)	-0.05	(0.08)	0.11***	**(0.02)**
Log(Teaching Grant Average)	0.04	(0.08)	0.07	(0.14)	0.18	(0.23)	-0.38*	**(0.16)**	-0.06	(0.06)	-0.07	(0.12)	-0.02	(0.25)
Log(Research Grant Average)	0.07	(0.07)	-0.03	(0.11)	-0.06	(0.18)	0.02	(0.05)	0.20**	**(0.07)**	0.22*	**(0.09)**	0.17+	(0.09)
Log(Teaching Load Average)	-1.24***	**(0.16)**	-1.24***	**(0.21)**	-1.41***	**(0.37)**	-1.19***	**(0.14)**	-1.38***	**(0.12)**	-1.18***	**(0.13)**	-2.05***	**(0.27)**
Friends	0.03***	**(0.01)**	0.03*	**(0.01)**	0.03***	**(0.01)**	-0.00	(0.02)	0.04***	**(0.01)**	0.03**	**(0.01)**	0.07*	(0.03)
LengthRelationship	-0.02	(0.07)	0.05	(0.09)	-0.03	(0.21)	0.06	(0.07)	-0.16*	**(0.07)**	-0.23*	**(0.09)**	-0.02	(0.22)
Dept Network Density	0.33***	**(0.05)**	0.53***	**(0.05)**	0.75***	**(0.16)**	0.25	(0.33)	-0.08	(0.09)	-0.12	(0.09)	-0.1	(0.19)
Female Dept Network Density	-0.14+	**(0.08)**	-0.27*	**(0.12)**	-0.44+	**(0.26)**	0.48**	**(0.15)**	0.01	(0.14)	0.15	(0.14)	-0.3	(0.25)
Network Size	-0.01	(0.01)	0.004	(0.01)	0.01	(0.01)	0.03***	**(0.01)**	-0.03***	**(0.01)**	-0.04***	**(0.01)**	-0.04**	**(0.02)**

Senior Female Faculty Dept Ties	0.04	(0.04)	0.05+	**(0.03)**	0.14	(0.10)	-0.13*	**(0.05)**	0.04	(0.09)	-0.02	(0.13)	0.16+	(0.09)
Tenure- Track URM Faculty in University	0.00	(0.00)	0.00	(0.00)	0.00**	**(0.00)**	-0.00**	**(0.00)**	-0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)
Tenure-Track University Faculty	-0.00	(0.00)	-0.00	(0.00)	-0.00***	**(0.00)**	0.00+	**(0.00)**	-0.00	(0.00)	0.00	(0.00)	-0.00*	(0.00)
Constant	5.00	(3.19)	4.96	(4.19)	5.26	(5.88)	6.23**	(2.26)	6.82**	(2.51)	7.37*	(3.43)	6.58+	(3.36)
Observations	1,442		729		391		338		713		425		288	
R^2	0.19		0.21		0.22		0.21		0.23		0.22		0.29	
Adjusted R^2	0.18		0.18		0.16		0.13		0.19		0.16		0.21	
Residual Std. Error	1.00 (df = 1411)		1.19 (df = 699)		1.37 (df = 362)		0.92 (df = 309)		0.74 (df = 683)		0.79 (df = 396)		0.67 (df = 259)	
F-Statistic	11.21*** (df = 30; 1411)		6.44*** (df = 29; 699)		3.65*** (df = 28; 362)		2.87*** (df = 28; 309)		6.92*** (df = 29; 683)		3.89*** (df = 28; 396)		3.70*** (df = 28; 259)	

APPENDIX D

BIVARIATE CORRELATION MATRIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
WLB														
Sense of belonging	0.16***													
Self-efficacy	0.04*	0.09***												
Woman	-0.18***	-0.02	0.02											
% Women Productivity	-0.05**	0.03	0.05**	0.03										
% Women Support	-0.06**	0.01	0.12***	0.05**	0.25***									
% Women Advice	-0.07***	0.11***	0.04*	0.08***	0.21***	0.40***								
Research University	-0.01	-0.23***	-0.02	0.03	0.01	-0.01	-0.10***							
% Women Dept	-0.09***	0.01	-0.03	0.39***	0.05**	0.04*	0.07***	0.03						
% Female Full Professors	-0.01	0.02	0.02	0.19***	0.01	0	-0.01	0.02	0.47***					
Dept Size	-0.02	-0.07***	0	-0.02	0.01	0.01	-0.04*	-0.02	-0.13***	-0.01				
Biochemistry	-0.05**	0.04*	0	-0.03	-0.01	0	0.01	0.01	-0.11***	-0.01	0.19***			
Biology	-0.07***	0.02	0.06**	0.10***	0.04**	0.04*	0.05**	-0.06***	0.26***	0.09***	-0.03	-0.34***		
Civil Engineering	-0.03	-0.09***	0.04*	-0.07***	-0.04*	0.03	-0.02	0.17***	-0.22***	-0.14***	-0.08***	-0.23***	-0.36***	
Math	0.14***	0.03	-0.11***	-0.01	-0.01	-0.07***	-0.05**	-0.09***	0.01	0.03	-0.05**	-0.29***	-0.46***	-0.31***
Assistant Prof.	-0.11***	0.02	-0.06**	0.10***	0.02	-0.02	0	0.01	0.03	-0.10***	-0.02	-0.02	0.03	0.02
Associate Pro.	-0.06**	-0.03	-0.05**	0.06***	-0.02	0	0.05**	-0.03	0.03	-0.12***	0	-0.01	0.02	0
Full Prof.	0.16***	0.01	0.10***	-0.14***	0	0.01	-0.05**	0.02	-0.05**	0.20***	0.01	0.03	-0.04*	-0.01
Marriage-like	-0.02	0.03	0.01	-0.17***	0.02	-0.03	-0.02	0.01	-0.06***	-0.03	-0.01	0.02	-0.03	0.04*
Tenure clock change	-0.09***	-0.05**	-0.02	0.14***	0.01	0.02	0.04*	0.04*	0.05**	0	-0.03	0.03	0.04*	-0.04*
Dependent care	-0.10***	0.01	0.03	0.08***	0.02	0.04*	0.07***	-0.04*	0.05**	0.06***	-0.03	0	0.05**	-0.04*
URM	0.02	-0.05*	0.07***	-0.03	0.01	0.04*	0.02	0.01	-0.03	-0.03	0.09***	-0.06***	0.08***	-0.01
Salary	0.11***	-0.03	0.16***	-0.11***	0.02	0.01	-0.07***	0.16***	-0.02	0.20***	0.08***	0.05**	-0.10***	0.19***
Publications	0.05*	-0.08***	0.03	-0.12***	0.03	0.01	-0.08***	0.26***	-0.04	0.07***	0.08***	0.16***	0	0.01
Teaching Grants	-0.06**	-0.07***	0.08***	0	-0.04*	0	-0.07***	-0.03	-0.05*	-0.04*	0.02	0	0.01	0.06**
Research Grants	-0.07***	-0.15***	0.06**	-0.01	0.01	0.05**	-0.04*	0.26***	-0.06**	-0.05**	0.03	0	-0.02	0.28***
Course Load	-0.31***	-0.02	0.09***	0.04*	0.04*	0.07***	0.05**	0.05**	0.02	0.06**	0.03	0.13***	0.08***	0.02
Friends	0	0.10***	0.18***	0.02	0.17***	0.18***	0.21***	-0.04*	0.07***	0.06***	0	0	0.12***	-0.09***
Length of Relationship	0.10***	-0.01	0	-0.10***	-0.04*	-0.02	-0.03	-0.02	-0.02	0.09***	0.04*	0.02	-0.01	-0.08***
Dept Network Density	0.01	0.13***	-0.09***	-0.02	0.07***	0.08***	0.25***	-0.06***	0.03	-0.01	0.03*	0	-0.01	-0.04*
Fem. Dept Network Density	-0.07***	0.06**	-0.03	0.20***	0.10***	0.10***	0.14***	-0.19***	0.31***	0.17***	0	0.03	0.17***	-0.19***
Network Size	-0.11***	0.13***	0.20***	0.12***	0.28***	0.27***	0.27***	0.03	0.11***	0.08***	0.03	0.09***	0.16***	-0.09***
Senior Female Faculty Dept Ties	-0.10***	0.12***	-0.03	0.17***	0.09***	0.10***	0.16***	-0.08***	0.18***	0.09***	0.03*	0.05**	0.12***	-0.12***
TT Women in Univ	0	-0.18***	0.01	0	-0.04**	0.02	-0.09***	0.30***	-0.06**	0.02	0.35***	-0.05**	0.01	0.07***
TT URM in univ	-0.04*	-0.20***	0	0.07***	-0.01	0	-0.09***	0.58***	0.11***	0.11***	0.11***	0.02	-0.07***	0.18***

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
WLB														
Sense of belonging														
Self-efficacy														
Woman														
% Women Productivity														
% Women Support														
% Women Advice														
Research University														
% Women Dept														
% Female Full Professors														
Dept Size														
Biochemistry														
Biology														
Civil Engineering														
Math														
Assistant Prof.	-0.03													
Associate Pro.	-0.01	-0.42***												
Full Prof.	0.03	-0.48***	-0.59***											
Marriage-like	-0.02	-0.04*	-0.02	0.06***										
Tenure clock change	-0.03	0.10***	0.06**	-0.15***	0									
Dependent care	-0.02	-0.14***	0.04*	0.09***	0.16***	0.09***								
URM	-0.02	0.05**	0.03*	-0.08***	-0.08***	-0.01	-0.01							
Salary	-0.10***	-0.40***	-0.24***	0.59***	0.04*	-0.09***	0.04*	-0.06***						
Publications	-0.15***	-0.16***	-0.12***	0.27***	0.07***	-0.08***	-0.02	-0.06**	0.36***					
Teaching Grants	-0.06**	-0.01	0.02	-0.01	-0.02	0.02	0.02	0.07***	-0.04	-0.06*				
Research Grants	-0.24***	0.09***	-0.01	-0.08***	0	-0.02	-0.03	0.03	0.05*	0.16***	0.15***			
Course Load	-0.21***	0.05**	-0.06***	0.01	-0.04*	-0.01	-0.05**	-0.01	0.08***	0.12***	0.04*	0.13***		
Friends	-0.04*	-0.10***	-0.02	0.10***	-0.03	0	0.05**	0.03	0.09***	0.05**	-0.02	-0.01	0.08***	
Length of Relationship	0.06***	-0.55***	0.16***	0.34***	0.03	0	0.11***	-0.03*	0.27***	0.12***	0	-0.08***	-0.06***	0.10***
Dept Network Density	0.05**	0.08***	0.04**	-0.11***	-0.02	0	0.04*	-0.01	-0.14***	-0.12***	-0.06**	-0.06**	-0.07***	0.03
Fem. Dept Network Density	-0.05**	0.04*	0.01	-0.05**	-0.04*	0.05*	0.08***	0.02	-0.07***	-0.08***	-0.02	-0.12***	0.06***	0.09***
Network Size	-0.16***	-0.05**	-0.02	0.07***	-0.01	0.02	0.06***	0.02	0.13***	0.10***	-0.03	0.02	0.19***	0.55***
Senior Female Faculty Dept Ties	-0.06***	0.28***	0.04*	-0.29***	-0.03	0.06***	0	0.07***	-0.23***	-0.06**	-0.03	-0.02	0.07***	0.07***
TT Women in Univ	-0.03*	0.02	-0.01	-0.01	-0.02	-0.01	-0.04*	0.25***	0.10***	0.14***	0.03	0.14***	0.01	-0.03
TT URM in univ	-0.10***	0.03*	-0.04*	0.01	0	0.02	-0.04*	0.03	0.23***	0.26***	-0.06**	0.23***	0.09***	-0.01

	28	29	30	31	32	33	34
WLB							
Sense of belonging							
Self-efficacy							
Woman							
% Women Productivity							
% Women Support							
% Women Advice							
Research University							
% Women Dept							
% Female Full Professors							
Dept Size							
Biochemistry							
Biology							
Civil Engineering							
Math							
Assistant Prof.							
Associate Pro.							
Full Prof.							
Marriage-like							
Tenure clock change							
Dependent care							
URM							
Salary							
Publications							
Teaching Grants							
Research Grants							
Course Load							
Friends							
Length of Relationship	0.10***						
Dept Network Density	0.03	-0.06**					
Fem. Dept Network Density	0.09***	-0.01	-0.02				
Network Size	0.55***	-0.09***	0.05**	0.11***			
Senior Female Faculty Dept Ties	0.07***	-0.18***	0.23***	0.49***	0.19***		
TT Women in Univ	-0.03	0	-0.02	-0.10***	-0.01	-0.02	
TT URM in univ	-0.01	-0.03	0	-0.13***	0.06***	-0.01	0.58***