Turnover Intentions in the STEM Fields: The Role of Departmental Factors

Krista Lynn Minnotte[1] (iD) · Daphne E. Pedersen[1]

Abstract

The underrepresentation of women faculty in the STEM fields (Science, Technology, Engineering, and Mathematics) remains a persistent feature of academia, with turnover being a contributing factor. The departmental context is likely implicated in the decision to stay or leave, as it is one of the key defining features of faculty members' work experiences. Using the job-demands resources theoretical approach, this study examines how four facets of university departments – department climate, department chair support, perceived injustice, and scholarly isolation – are related to turnover intentions among STEM tenure-system faculty, along with whether these relationships differ by gender. Data are from STEM tenure-system faculty at a mid-sized university located in the upper Midwest ($N = 117$ faculty members). The findings indicate each facet of the department is related to STEM faculty members' turnover intentions, regardless of gender. Taken together, these findings suggest that improving the department atmosphere may enhance retention of men and women STEM faculty members alike.

Dr. Krista Lynn Minnotte is Professor of Sociology at the University of North Dakota. Her research centers on examining the interrelationships among gender, work, and family. Dr. Minnotte is particularly interested in the intersection of cultural and structural elements in understanding how people navigate paid work and family. She currently serves on the Executive Committee of the Work and Family Researchers Network and as Co-Editor of The Social Science Journal.

Dr. Daphne E. Pedersen is Professor and Department Chair of Sociology at the University of North Dakota. Her research interests include gender, the sociology of health, work and well-being. Dr. Pedersen's research focuses on various populations, including dual-career couples, working parents, college students, and STEM faculty. She is particularly interested in stress processes, and how different aspects of people's lives intersect to shape health and wellness. Dr. Pedersen currently serves as Co-Editor of The Social Science Journal, and is the immediate Past-President of Alpha Kappa Delta, the international sociology honor society.

✉ Krista Lynn Minnotte
krista.minnotte@und.edu

[1] Department of Sociology, University of North Dakota, Grand Forks, ND, USA

The persistent underrepresentation of women faculty in the STEM fields remains a vital concern among policy makers and scholars (e.g., Blackburn, 2017). Women's representation in STEM faculty positions is central to increasing the competitive edge of the US globally by contributing to a vibrant STEM workforce (Goulden, Mason, & Frasch, 2011; Xie, Fang, & Shauman, 2015). This is because STEM women faculty often serve as role models to undergraduate and graduate students, particularly women, thereby increasing the number of STEM majors and those pursuing advanced degrees (e.g., Cheryan, Siy, Vichayapai, Drury, & Kim, 2011; Herrmann, Adelman, Bodford, Oliver Graudejus, & Virginia, 2016). Women's underrepresentation among STEM faculty is a multi-faceted problem, encompassing issues pertaining to recruitment, tenure and promotion, and retention. At the heart of this puzzle is the creation of STEM academic workplaces that are positive for women.

Previous research suggests that while women may not leave STEM fields at higher rates than men do (Kaminski & Geisler, 2012), they report less job satisfaction (Sabharwal & Corley, 2009) and higher turnover intentions than STEM men (Callister, 2006; Xu, 2008). The existing literature in this area points to lack of research support, fewer advancement opportunities, and issues at the departmental level, including lack of collegiality, feelings of isolation, and poor relationship quality, as predictors of turnover intentions among women (e.g., Callister, 2006; Riffle, Schneider, Hillard, Polander, & Jackson, 2013; Xu, 2008). Other studies point to work-family issues, including the perceived stigmatization associated with needing workplace flexibility to deal with family situations, as factors contributing to turnover intentions and lower intent to persist among both men and women in STEM (Cech & Blair-Loy, 2014; Watanabe & Falci, 2016). Building on this previous scholarship, we bring the departmental environment to the forefront because it is the primary context in which the careers of faculty members unfold. Using the job-demands-resources theoretical model (Bakker & Demerouti, 2006; Bakker & Demerouti, 2017), we examine whether departmental resources and demands predict the turnover intentions of men and women STEM tenure-system faculty members in similar ways. While turnover intentions are sometimes viewed as a barometer of job dissatisfaction, these two outcomes are conceptually distinct. Faculty members may seek to leave a position for a variety of reasons, some of which are connected to job dissatisfaction and some of which are not. This study focuses on turnover from a specific institution, which may or may not, result in turnover from the STEM professoriate altogether. While the second may be more problematic in terms of women's overall representation in the STEM fields, institutional turnover does matter for gender inequalities at specific institutions. Indeed, women's underrepresentation at the institutional level shapes access to role models for students at specific institutions and may contribute to unpleasant working conditions among those who remain (Hillard, Schneider, Jackson, & LaHuis, 2014). The importance of the institution for gender representation in STEM is underscored by the fact that NSF ADVANCE grants target the institution as the entry point for enhancing women's representation (Jovanovic & Armstrong, 2014; Morimoto, Zajicek, Hunt, & Lisnic, 2013).

We narrow our attention to tenure-system faculty members because of the unique pressures entailed in tenure-track positions (such as steeper research demands) and efforts to enhance women's representation in STEM often target tenure-system positions where women are especially underrepresented (Cech & Blair-Loy, 2014; Stephan-Norris & Kerrissey, 2016; Taylor, Beck, Lahey, & Froyd, 2017). Moreover, the contributors to turnover intentions among those in non-tenure-track positions likely differ, as they face a number of distinct stressors, including heightened job precariousness, role ambiguity, lack of recognition, and exclusion/invisibility (e.g., Drake, Struve, Meghani, & Bukoski, 2019; Haviland, Alleman, & Allen, 2017; Miller & Struve, 2020). Nonetheless, we acknowledge that those in non-tenure system positions are an important part of the larger social environment of academic departments, especially as institutions of higher

education increasingly rely on such instructors (Kezar, 2013; Kezar & Gerhke, 2014; Kezar & Gerhke, 2016). In addressing the turnover intentions of tenure-system faculty members, we pinpoint four facets of the department environment – department climate, department chair support, perceived injustice, and scholarly isolation – as potential contributors to turnover intentions. Data from STEM tenure-system (tenure-track and tenured) faculty at a mid-sized university in the upper Midwest ($N = 117$ tenure-system faculty members) are used to examine the research questions. The findings indicate each hypothesized departmental resource and demand is related to STEM faculty members' turnover intentions, regardless of gender. Taken together, these findings suggest that improving the department atmosphere may improve retention of men and women STEM faculty members alike.

The Job-Demands Resources Model

According to the job-demands resources model, the resources and demands surrounding a worker are pivotal in shaping job-related outcomes (Bakker & Demerouti, 2006; Bakker & Demerouti, 2017). Job resources improve work conditions, facilitating stronger performance and motivation, while job demands detract from performance, creating difficulties and stress for workers (Bakker & Demerouti, 2006, 2017). The particular combination of job resources and demands present in a given workplace is central to understanding the experiences of workers across a variety of employment sectors, including call center workers, those employed in human services, and medical workers (e.g., Bakker, Demerouti, & Schaufeli, 2003; Bakker, ten Brummelhuis, Prins, & van der Heijden, 2011; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). The complex resources and demands present in a workplace are implicated in a variety of job-related outcomes, ranging from job satisfaction to work-to-family conflict to burnout, absenteeism, and turnover (e.g., Demerouti et al., 2001; Bakker et al., 2003; Bakker, Demerouti, & Dollard, 2008; Lewig & Dollard, 2003).

This model can also be helpful in understanding the job outcomes of faculty members who face a unique combination of stressors in the academic context. Indeed, the open-ended nature of faculty members' job duties, combined with expectations to work long hours, often feature prominently in explanations of faculty stress (Fox, Fonseca, & Bao, 2011; Lindholm & Szelényi, 2008; Rafnsdóttir & Heijstra, 2013). Examining specific job resources and demands encountered by faculty members can help us to gain a stronger understanding of how to improve faculty outcomes through an awareness of the unique contexts in which they work. As such, other scholars have used this theoretical approach to examine how a variety of demands and resources encountered by faculty members are related to professional commitment, work engagement, and job satisfaction, as well as burnout and work-family turnover intentions (Dorenkamp & Ruhle, 2019; Mudrak et al., 2018; Sabagh, Hall, & Saroyan, 2018; Watanabe & Falci, 2016). Here we apply the approach to understanding turnover intentions among STEM faculty members by considering job resources and demands operating at the departmental level. In doing so, we contribute to a growing literature demonstrating the importance of workplace context, particularly the department, for faculty outcomes. The context of the department is especially important because faculty members not only spend most of their time in the department, but the department is where most interactions with coworkers occur and where many of the decisions that directly affect faculty members are made (Callister, 2006). For instance, faculty members often rely upon department colleagues when they need assistance, such as helping cover classes for illness or leave (Lundquist, Misra, & O'Meara, 2012). At the same time, it is within the department that perceived inequity and differential treatment is often first observed (Riffle et al., 2013). Official procedures and policies are often played out at the

departmental level, sometimes revealing discrepancies between official campus-level policies and departmental decisions and interactions (Lundquist et al., 2012; Sallee, 2012). Despite these patterns, surprisingly few studies of faculty members bring the department context to the forefront.

Departmental Resources and Turnover Intentions

Faculty members may encounter a rich array of resources in their departments, ranging from affective resources (e.g., supportive colleagues) to instrumental resources (e.g., access to travel funding). Theoretically, greater access to departmental resources should predict lower turnover intentions, as resources help faculty members to perform at higher levels and contribute to faculty members' success (Bakker & Demerouti, 2006, 2017). Here we consider two key departmental level resources—a positive departmental climate and department chair support. We conceptualize a positive department climate as one in which faculty members feel that they fit in, are able to raise concerns, and feel valued by others in the department. Positive climates facilitate the success and integration of faculty members by valuing who they are and the concerns they bring to the table. The role of positive climates in shaping faculty outcomes is understudied in research on the working conditions of STEM faculty members, with most research focused on negative climate issues. However, previous researchers have found that positive facets of a departmental climate, such as sensing one's voice matters in department decisions, along with being a part of departmental conversations, were associated with higher job satisfaction among STEM women faculty (Settles, Cortina, Stewart, & Malley, 2007). Other research has connected psychological safety, the feeling that a worker can be his or her true self and take risks within the department, to lower work-to-life conflict, higher job satisfaction, and lower intentions to quit among STEM men and women faculty (Callister, 2006; Minnotte & Pedersen, 2019).

While a positive climate reflects the atmosphere and connections a faculty member has to the department as a whole, department chair support is concerned with faculty members' relationships with those who hold positions of departmental leadership. The department chair can be a supportive figure who enhances the experiences of faculty members by providing encouragement and assistance, helping them to solve problems, and assisting with gaining access to access university resources (Czech & Forward, 2010), thereby serving as a job resource. Chairs can also assist faculty members as they navigate the academic terrain, helping them to understand layers of academic bureaucracy, including the tenure and promotion process. However, not all faculty members have access to department chair support for a variety of reasons, including lack of adequate department chair preparation and training opportunities, resulting in the underdevelopment of the skillset needed to lead a department effectively (Gonaim, 2016; Schwingammer et al., 2012). An effective and supportive department chair can make a world of difference to faculty members. For example, previous research has connected perceptions of effective departmental chair leadership to enhanced job satisfaction and productivity among STEM women (Settles, Cortina, Malley, & Stewart, 2006). Other research has found associations between department chair support and lower turnover intentions and higher work satisfaction among one particular subset of STEM—pharmacy faculty members (Conklin & Desselle, 2007; Desselle & Conklin, 2010). Given the empirical literature on positive departmental climates and department chair support, and informed by the job-demands-resources theoretical model (Bakker & Demerouti, 2006, 2017), we propose the following hypothesis:

H 1:   The job resources of a positive department climate and department chair support will be negatively related to turnover intentions among STEM tenure-system faculty.

Departmental Demands and Turnover Intentions

Job demands are also present in departments, in some cases functioning in ways that create stress and undermine well-being among STEM faculty members. Here we pinpoint two departmental level job demands that may be especially pertinent in predicting turnover intentions among STEM faculty: perceived injustice and scholarly isolation. The first, perceived injustice, focuses on the division of departmental labor and potential favoritism occurring at the departmental level. The second, scholarly isolation, is concerned with situations in which a faculty member's scholarship and research expertise are not valued by departmental colleagues.

Perceived injustices and favoritism in workplaces are often detrimental to job-related outcomes. The wider literature highlights a host of negative outcomes, including emotional exhaustion, coworker conflict, turnover intentions, and even deviant behavior within the workplace that are associated with these job demands (Crowley, 2014; Ferris, Spence, Brown, & Heller, 2012; Howard & Cordes, 2010). Injustices can also unfold in academic contexts, with decisions surrounding workload, evaluation, and the allocation of resources having the potential to be tinged with favoritism (Roos & Gatta, 2009). As such, perceived injustice and lack of fairness in academic contexts have the potential to create faculty stress and undermine trust (Graso, Jiang, Probst, & Benson, 2014; Judge & Colquitt, 2004; Ramasamy & Abdullah, 2017). Although understudied, perceived injustice might be particularly salient in the STEM context because of the competition for scarce resources and opportunities interwoven into such fields (Xu & Martin, 2011). Empirically, perceived injustice in service work distribution has been linked to reduced job satisfaction and increased stress among STEM faculty members (Pedersen & Minnotte, 2018). Here we zero in on perceived injustice at the departmental level, especially in terms of workload distribution and perceived favoritism, focusing on how it may contribute to turnover intentions.

In academic circles, research and scholarship are viewed as central to a faculty member's identity and career success, especially in the STEM fields (Ecklund & Lincoln, 2016; Ward & Wolf-Wendel, 2012). Past scholarship has identified a number of difficulties STEM women faculty have faced with how their scholarship has been viewed by their departments. For example, in some studies, women STEM faculty were less likely to discuss research with departmental colleagues, and faced unwarranted scrutiny of their scholarly records and inaccurate estimations of their research productivity at the departmental level (Riffle et al., 2013; Fox, 2010; Hart, 2016). Regardless of gender, given the high esteem placed on scholarship in academic STEM fields, scholarly isolation is likely an unwelcome phenomenon. Along these lines, previous work has found linkages between scholarly alienation – feelings that others in the department do not value one's scholarship and research expertise—and lower levels of job satisfaction (Settles, Cortina, Buchanan, & Miner, 2012). Altogether, we expect that both perceived injustice and scholarly isolation operate as job demands, potentially fueling turnover intentions, leading to the following hypothesis:

H 2:   The job demands of perceived injustice and scholarly isolation will be positively related to turnover intentions among STEM tenure-system faculty.

Gender and Departmental Resources and Demands

A consistent theme emerges from past research on STEM faculty—women face a rich array of difficulties at the departmental level. Past research indicates, for example, that women tend to characterize their departments as less collegial, inclusive, and helpful, and places where they receive less recognition compared to men (Riffle et al., 2013; Fox, 2010). STEM women also appear more likely to encounter issues pertaining to favoritism in various decision-making processes at the departmental level (Roos & Gatta, 2009). Negative department climates, in turn, have been linked to reduced job satisfaction and felt influence among STEM women faculty members (Settles et al., 2006; Settles et al., 2007; Settles et al., 2012).

Adding to this situation is the gendered division of labor present in many academic workplaces. Women are more likely to devote time to activities that are undervalued in promotion, such as teaching and service, coming at a cost to time allocated to research (Carrigan, Quinn, & Riskin, 2011; Hart, 2016; Hart & Cress, 2008). Both men and women faculty would generally prefer to spend more time than they do on research, but the gap between actual time spent on research and preferred time on research is greater for women faculty than men (Winslow, 2010). This gendered division of labor contributes to dissatisfaction among STEM women, and perceived inequity in departmental service and teaching acts as a barrier to their career progress (Carrigan et al., 2011; Hart, 2016). Women faculty also tend to have greater caregiving responsibilities than men (Misra, Lundquist, & Templer, 2012; Rafnsdóttir & Heijstra, 2013; Sallee, Ward, & Wolf-Wendel, 2016), leading to the dual pressure of carrying heavier burdens in teaching/service and caregiving. Because STEM women often labor in departments characterized by numerous issues, as outlined above, we hypothesize job resources and demands at the departmental level may be especially important to understanding their turnover intentions, leading to the following hypothesis:

H 3: The relationships between job resources and job demands and turnover intentions will be stronger for STEM women compared to STEM men holding tenure-system positions.

Background Variables and Turnover Intentions

This study controls for age, rank, parental status, and the college of the respondent in predicting turnover intentions. Past research suggests that younger faculty members report more stress and higher turnover intentions than older faculty members, leading us to control for age (Lindholm & Szelényi, 2008; Post, DiTomaso, Farris, & Cordero, 2009). Rank is incorporated into the analyses because the factors associated with turnover intentions may vary across the academic life course, with those who are early career encountering differing, and often more stressful, demands than those at later career stages (Eddy & Gaston-Gayles, 2008; O'Meara, Bennett, & Niehaus, 2016). We control for the college of the respondent because access to resources may vary across the broader setting in which respondents work. We consider parental status because of the difficulties parents in the STEM fields often encounter navigating work and family responsibilities (Ecklund & Lincoln, 2016; Sallee & Pascale, 2012). For example, women scientists report struggling in the face of academic cultures stipulating they should prioritize work above all else (Sallee & Pascale, 2012), while other research suggests academic fathers struggle with finding ways to be involved parents in

the face of high-pressure work demands (Damaske, Ecklund, Lincoln, & White, 2014; Ecklund & Lincoln, 2016). Marital status is also considered because those with partners may have higher turnover intentions due to lack of adequate work for their partners. On the other hand, it is possible that single faculty members may be less tied to specific locations, making them more apt to have higher turnover intentions.

Method

Data for this study are from a climate survey distributed to STEM tenure-system faculty at a single institution. The university is a comprehensive, doctoral granting institution located in the Upper Midwest and has a student body of approximately 15,000. At this campus, the STEM fields (engineering, life sciences, physical sciences, aerospace sciences, social sciences, and mathematics) are spread across four colleges. All tenure-system faculty in STEM departments were sent a letter to their campus mailbox and an email invitation to participate in the study. At the time of survey distribution, the majority of faculty at the university held tenure-system positions. According to institutional data, the proportion of tenure-system faculty relative to non-tenure-system faculty varied by college: in the College of Aerospace roughly 70% of instructional faculty held tenure-system positions, compared to 86% in the College of Arts and Sciences and the College of Business and Public Administration, and 95% of faculty in the College of Engineering and Mines. The climate survey was administered online using SurveyMonkey. To incentivize participation, those who completed the questionnaire were given the option to enter a drawing to win one of fifty $50 gift cards. The survey was open for a period of approximately one month, at which time just over 50% of the eligible tenure-system faculty members participated ($N = 117$). Overall, the respondents in the sample were relatively similar to the faculty as a whole. The majority of female respondents were assistant (29.4%) and associate (58.8%) professors, with few female full professors (11.8%) in the sample. These proportions mirror the distribution within STEM departments at the university: women made up 18.9% of assistant, 23.4% of associate, and 8.3% of full professors in STEM at the time of data collection – reflective of gender disparities within the institution. The sample was also demographically similar in terms of rank within each college, with the exception of the College of Business and Public Administration. From within this college, associate and full professors were disproportionately represented in the data and unlike the college itself, more full than associate professors responded to the survey request.

Measures

Dependent Variable *Turnover intentions* was measured by asking faculty "In the next three years, how likely are you to leave your job [at the university]?" Possible responses ranged from (1) = not very likely to (5) = very likely. The mean for the sample was 2.25 ($SD = 1.30$), indicating that faculty members, on average, generally did not intend to leave their position at the university in the near future.

Independent Variables Two variables were used to represent job resources of faculty: positive department climate and department chair support. *Positive department climate* was measured using an index composed of responses to six items ($\alpha = .78$). Faculty were asked, "Thinking about your experiences in your department, (a) How well are you able to navigate

unwritten rules about how one is to conduct oneself as a faculty member? (b) How reluctant are you to voice concerns about a colleague's behavior for fear it might affect your reputation or advancement? (reverse coded) (c) How valued by your colleagues is your research and scholarship? (d) How much harder do you have to work than some of your colleagues to be perceived as a legitimate scholar? (reverse coded) (e) How comfortable are you in raising personal/family responsibilities when scheduling departmental obligations? and (f) How well do you fit into your department?" Responses were coded (1) = not at all to (5) = completely. On average, faculty members reported their department climate was slightly more negative than positive ($M = 2.39$, $SD = .71$).

Fourteen items were included in the index of *department chair support*. Faculty were asked to rate their department chair in each of the following areas: (a) Maintains high academic standards, (b) Is open to constructive criticism, (c) Is an effective administrator, (d) Shows interest in faculty, (e) Encourages and empowers faculty, (f) Treats faculty in an evenhanded way, (g) Helps me obtain resources I need, (h) Gives me useful feedback about my performance, (i) Articulates a clear vision, (j) Articulates clear criteria for promotion/tenure, (k) Honors agreements, (l) Handles disputes/problems effectively, (m) Communicates consistently with faculty, and (n) Shows commitment to racial-ethnic diversity. Responses included (1) = poor, (2) = below average, (3) average, (4) above average, and (5) excellent. Responses to the items were summed and then averaged; the alpha reliability coefficient for the index was .97. The mean for department chair support was 3.56 ($SD = .91$), falling between ratings of average and above average.

Perceived injustice and scholarly isolation were used to represent faculty job demands. *Perceived injustice* was measured using an index adapted from Hodson and colleagues (1994), with the four items modified to apply to the academic workplace. Respondents were asked the degree to which they agreed or disagreed with the following: (a) Some faculty in my department receive special treatment because they are friendly with the department chair, (b) Some faculty in my department sometimes get credit for doing more than they actually do, (c) Some faculty avoid service work leading to unfair workloads, and (d) The work of the department is often more difficult than it needs to be because some faculty do not do their fair share of departmental governance/service. Response categories ranged from 1 = strongly disagree to 6 = strongly agree. Responses were then averaged to create the index ($\alpha = .87$). The mean score was 3.55 ($SD = 1.34$); on average, faculty members reported being somewhat neutral in reports of perceived injustice.

A five-item index was used to measure *scholarly isolation*. This construct refers to the degree to which faculty feel isolated or integrated into their departments, particularly with regard to research work (University of Michigan ADVANCE, 2013). Respondents were provided the following statements: (a) I am comfortable asking questions about my performance expectations; (b) My colleagues solicit my opinions about their research ideas and problems; (c) My research interests are valued by my colleagues; (d) I feel pressures to change my research agenda in order to fit in; (e) I feel/felt pressured to change my research agenda to get tenure/be promoted; and (f) My colleagues have lower expectations of me than of other faculty. Response categories ranged from 1 (strongly disagree) to 6 (strongly agree). Items (a), (b), and (c) were reverse coded, and all items were summed and then averaged to create the index. The alpha reliability coefficient was .81. For this index, the average was near the low end of the scale, indicating that many faculty members did not feel high levels of scholarly isolation ($M = 2.40$, $SD = .86$).

Gender was also included as a key independent variable in the analysis (0 = male, 1 = female). Overall, 69% of the sample were men and 31% were women.

Control Variables Control variables included *age* (measured in years), *parental status* (0 = non-parent, 1 = parent), *marital status* (0 = single, 1 = married or cohabiting), *rank* (0 = pre-tenure, 1 = tenured), and *college* (0 = from a STEM department outside the College of Arts and Sciences, 1 = from a STEM department housed in the College of Arts and Sciences). In order to maintain confidentiality of faculty participants, we did not gather data about department affiliation. Because of the small sample size, college is treated as a dummy variable (rather than a series of dummy variables) in order to maintain an appropriate number of variables relative to sample size in the statistical models. On average, respondents were 48.35 years old (*SD* = 10.23). About three-quarters of the sample had tenure, and over half worked in departments located in the College of Arts and Sciences. Sixty-nine percent had dependent children and over 83% were married or cohabiting.

Analytic Strategy

First, we present descriptive statistics (Table 1) in order to provide a basic understanding of how the study variables are distributed among faculty respondents. The hypotheses are then tested using Ordinary Least Squares (OLS) regression. We estimated separate regression equations for each demand/resource in order to avoid potential problems with multicollinearity between the independent variables. Three models were generated for each demand/resource: (a) a baseline model in which only the control variables were included; (b) a second model that included the demand or resource (Hypotheses 1 and 2); and (c) a final model in which the interaction term between gender and the demand or resource was included (Hypothesis 3). Mean substitution was used to handle missing data. Both tolerance values and variance inflation factors (VIF) indicated that multicollinearity was not a concern in the models.

Results

OLS regression findings are presented in Tables 2, 3, 4 and 5. None of the baseline models (Model 1, in which only control variables were included) were statistically significant, whereas all main effects models (Model 2, in which the independent variable was added) were statistically significant, except the Model 2 that used department chair support as the independent variable (the significance level for this model was .083). The findings pertaining to Hypothesis 1 can be found in Tables 2 and 3. Consistent with Hypothesis 1, the job resources of a positive department climate ($\beta = -.40^{***}$) and department chair support ($\beta = -.24^{**}$) were negatively associated with the turnover intentions of STEM tenure-system faculty members (although, it should be noted the main effects model for department chair support did not achieve statistical significance at the $p < .05$ level). The findings also supported Hypothesis 2: the job demands of perceived injustice ($\beta = .28^{**}$) and scholarly isolation ($\beta = .34^{***}$) were positively related to the turnover intentions of STEM tenure-system faculty members (see Tables 4 and 5).

Table 1 *Descriptive Statistics* (N = 117)

	Scale Range	Mean (SD)
Age		48.35 (10.23)
Parental status[a]	0–1	0.69
Marital status[b]	0–1	0.83
Rank[c]	0–1	0.75
College[d]	0–1	0.53
Gender[e]	0–1	0.31
Positive department climate	1–5	2.39 (0.71)
Department chair support	1–5	3.56 (0.91)
Perceived injustice	1–6	3.55 (1.34)
Scholarly isolation	1–6	2.40 (0.86)
Turnover intentions	1–5	2.25 (1.30)

[a] Parental status is coded 0 = non-parent, 1 = parent

[b] Marital status is coded 0 = single, 1 = married or cohabiting

[c] Rank is coded 0 = pre-tenure and 1 = tenured

[d] College is a dummy variable for which 0 = all other colleges, and 1 = department located in the College of Arts and Sciences

[e] Gender is coded 0 = male and 1 = female

Hypothesis 3 predicted that the relationships between job resources and job demands and turnover intentions would be stronger for STEM women compared to STEM men. Contrary to expectations, support for this hypothesis was not found, as the interactions between gender and the independent variables were not significant in any of the regression equations. The explained variance ranged from 5 to 15% for the main effects models, the highest being found

Table 2 *Summary OLS Regression Results for Models Regressing Turnover Intentions on Positive Department Climate* (N = 117)

	(1) B (SE B)	β	(2) B (SE B)	β	(3) B (SE B)	β
Age	.000(.01)	.003	−.002(.01)	−.02	−.004(.01)	−.03
Parental status[a]	−.58*(.29)	−.21	−.46(.26)	−.16	−.45(.26)	−.16
Marital status[b]	.15(.39)	.04	−.15(.38)	−.04	−.11(.37)	−.03
Rank[c]	−.18(.33)	−.06	−.09(.31)	−.03	−.03(.31)	−.01
College[d]	−.15(.25)	−.06	−.15(.23)	−.06	−.16(.23)	−.06
Gender[e]	−.14(.29)	−.05	−.27(.27)	−.10	.54(.63)	.19
Positive department climate			−.72****(.16)	−.40	−.67***(.16)	−.37
Positive department climate X gender					−.39(.28)	−.31
Adjusted R^2	.001		.15		.16	
F	1.021		3.987**		3.771**	

[a] Parental status is coded as a dummy variable: 0 = non-parent and 1 = parent

[b] Marital status is coded as 0 = single and 1 = married or cohabiting

[c] Rank is coded 0 = pre-tenure and 1 = tenured

[d] College is a dummy variable for which 0 = all other colleges and 1 = department located in the College of Arts and Sciences

[e] Gender is coded 0 = male and 1 = female

*p < .05, ** p < .01, *** p < .001

Table 3 *Summary OLS Regression Results for Models Regressing Turnover Intentions on Department Chair Support* (N = 117)

	(1) B (SE B)	β	(2) B (SE B)	β	(3) B (SE B)	β
Age	.000(.01)	.003	.002(.01)	.02	.002(.01)	.02
Parental status[a]	−.58*(.29)	−.21	−.55*(.28)	−.20	−.55(.28)	−.20
Marital status[b]	.15(.39)	.04	.04(.39)	.01	.04(.39)	.01
Rank[c]	−.18(.33)	−.06	−.36(.33)	−.12	−.36(.34)	−.12
College[d]	−.15(.25)	−.06	−.10(.25)	−.04	−.10(.25)	−.04
Gender[e]	−.14(.29)	−.05	−.17(.28)	−.06	−.15(.71)	−.05
Department chair support			−.34*(.13)	−.24	−.34*(.14)	−.24
Department chair support X gender					−.004(.20)	−.01
Adjusted R²	.001		.05		.041	
F	1.021		1.860[f]		1.612	

[a] Parental status is coded as a dummy variable: 0 = non-parent and 1 = parent

[b] Marital status is coded as 0 = single and 1 = married or cohabiting

[c] Rank is coded 0 = pre-tenure and 1 = tenured

[d] College is a dummy variable for which 0 = all other colleges and 1 = department located in the College of Arts and Sciences

[e] Gender is coded 0 = male and 1 = female

[f] Sig = .083; * p < .05, ** p < .01, *** p < .001

for the model examining positive department climate. It should be noted that across many of the models, the control variable parental status was negatively associated with turnover intentions, such that those without dependent children were more likely to report the possibility of leaving the university in the near future.

Table 4 *Summary OLS Regression Results for Models Regressing Turnover Intentions on Perceived Injustice* (N = 117)

	(1) B (SE B)	β	(2) B (SE B)	β	(3) B (SE B)	β
Age	.000(.01)	.003	.01(.01)	.05	.01(.01)	.05
Parental status[a]	−.58*(.29)	−.21*	−.51(.28)	−.18	−.51(.28)	−.18
Marital status[b]	.15(.39)	.04	.03(.38)	.01	.04(.38)	.01
Rank[c]	−.18(.33)	−.06	−.27(.32)	−.09	−.23(.33)	−.08
College[d]	−.15(.25)	−.06	−.14(.25)	−.05	−.12(.25)	−.05
Gender[e]	−.14(.29)	−.05	−.38(.29)	−.13	.15(.70)	.05
Perceived injustice			.27**(.09)	.28	.31**(.10)	.32
Perceived injustice X gender					−.14(.17)	−.22
Adjusted R²	.001		.065		.063	
F	1.021		2.158*		1.969	

[a] Parental status is coded as a dummy variable: 0 = non-parent and 1 = parent

[b] Marital status is coded as 0 = single and 1 = married or cohabiting

[c] Rank is coded 0 = pre-tenure and 1 = tenured

[d] College is a dummy variable for which 0 = all other colleges and 1 = department located in the College of Arts and Sciences

[e] Gender is coded 0 = male and 1 = female

* p < .05, ** p < .01, *** p < .001

Table 5 *Summary OLS Regression Results for Models Regressing Turnover Intentions on Scholarly Isolation* ($N = 117$)

	(1) B (SE B)	β	(2) B (SE B)	β	(3) B (SE B)	β
Age	.000 (.01)	.003	.004(.01)	.03	.003(.01)	.02
Parental status[a]	−.58*(.29)	−.21	−.47(.27)	−.17	−.47(.27)	−.17
Marital status[b]	.15(.39)	.04	−.07(.38)	−.02	−.08(.38)	−.02
Rank[c]	−.18(.33)	−.06	−.25(.32)	−.08	−.24(.32)	−.08
College[d]	−.15(.25)	−.06	−.19(.24)	−.07	−.19(.24)	−.07
Gender[e]	−.14(.29)	−.05	−.19(.27)	−.07	−.41(.86)	−.14
Scholarly isolation			.51***(.14)	.34	.50**(.15)	.33
Scholarly isolation X gender					.09(.34)	.08
Adjusted R^2	.001		.11		.10	
F	1.021		3.020**		2.629*	

[a] Parental status is coded as a dummy variable: 0 = non-parent and 1 = parent

[b] Marital status is coded as 0 = single and 1 = married or cohabiting

[c] Rank is coded 0 = pre-tenure and 1 = tenured

[d] College is a dummy variable for which 0 = all other colleges and 1 = department located in the College of Arts and Sciences

[e] Gender is coded 0 = male and 1 = female

* $p < .05$, ** $p < .01$, *** $p < .001$

Discussion

Informed by the job-demands-resources theoretical perspective (Bakker & Demerouti, 2006; Bakker & Demerouti, 2017), this study examined the relationships between departmental resources and demands in predicting turnover intentions among STEM tenure-system faculty members. Given concerns about retaining STEM tenure-system faculty members (Xu, 2008), especially women (Blackburn, 2017), understanding predictors of turnover intentions is of central importance. Three key findings emerged. First, as predicted, departmental resources—positive department climate and department chair support—were negatively associated with turnover intentions. On the other hand, the departmental demands of perceived injustice and scholarly isolation were positively associated with turnover intentions. Additionally, the findings from the present study painted a consistent picture in which departmental demands and resources mattered in similar ways for men and women tenure-system faculty members in predicting turnover intentions. Although women may be more likely to encounter fewer resources and greater demands at the departmental level, when such resources and demands are present, they do not operate in divergent ways to predict possible turnover among men and women. The findings from the present study, then, contribute to a growing pool of research, suggesting that men and women appear to respond similarly when faced with the same stressors and resources in their work lives (Cech & Blair-Loy, 2014; Pedersen & Minnotte, 2018; Watanabe & Falci, 2016), including within the STEM disciplines.

Theoretically, our study contributes to a growing scholarship applying the job-demands-resources perspective to the context of higher education (Dorenkamp & Ruhle, 2019; Mudrak et al., 2018; Sabagh et al., 2018). In particular, we sharpen the understanding of specific demands and resources that matter in predicting the turnover intentions of STEM tenure-system faculty members. Other studies applying this perspective to academic contexts have noted a number of demands and resources important to faculty members. The resources of

affective commitment and support from colleagues and supervisor have been connected to job satisfaction, work engagement, and lower stress (Dorenkamp & Ruhle, 2019; Mudrak et al., 2018). On the other hand, job demands such as job insecurity and work-to-life conflict have been linked to negative outcomes, including heightened stress and lower job satisfaction (Dorenkamp & Ruhle, 2019; Mudrak et al., 2018). Here we build on this literature by showing the importance of specific departmental resources and demands, including a positive department climate, department chair support, scholarly isolation, and perceived injustice to the decision of whether a faculty member will remain at the university – what some consider the ultimate outcome of work stress and job satisfaction (Rosser, 2004). We are hopeful that future scholars will continue to identify additional resources and demands in higher education contexts that matter in predicting STEM faculty outcomes, particularly at the departmental level.

On a practical level, the findings from this study suggest administrators interested in reducing turnover intentions among STEM tenure-system faculty members should take steps to foster a positive departmental climate and enhanced departmental chair support, while also curtailing perceived injustice and scholarly isolation. Previous research suggests a few pathways that may prove useful. For example, existing scholarship suggests engaging in departmental level work together, such as making strategic curricular changes or creating a new mission statement, can have unintended ripple effects such as improved climate and culture within the department (Driskill, Chatham-Carpenter, & McIntyre, 2019; Holmes, Jackson, & Stoiko, 2016). By bringing faculty members together, even on projects unrelated to research, the possibility for forming collaborative research relationships grows (Katerndahl, 2012). Thus, departmental work may also help build a community of scholars among faculty members, thereby potentially reducing scholarly isolation. Finding ways for faculty members to share their research with each other in the department context can also help reduce scholarly isolation.

Department chairs often enter leadership positions with little training (Gonaim, 2016; Schwingammer et al., 2012). Therefore, the provision of leadership training for department chairs that incorporates the importance of communication and relationship building may reduce turnover intentions by improving perceptions of department chair support. Perceptions of injustice may be reduced by finding ways to create more equitable service loads and to ensure that favoritism does not occur in the allocation of resources. Department chairs play pivotal roles in addressing these concerns. Reducing perceived injustice centers on cementing faculty awareness of the explicit rules and procedures that are followed when resources are allocated, along with the department chair leading with a visible commitment to fairness (Lumpkin, 2004). The job-demands-resources model (Bakker & Demerouti, 2017) also recognizes the agency of workers and their roles in building resources and curbing demands. Thus, we encourage faculty members to be mindful of the actions they can take to address these issues.

Limitations of this study should be taken into consideration. First, the data for this study are from a regional sample at a single university situated within a specific geographic context, precluding the ability to generalize the findings to other types of colleges and universities. While we are hopeful the findings have relevance more broadly, we need to be cautious in drawing conclusions about the role of the study variables in other higher education contexts. Second, the relatively small sample size limited the number of departmental demands and resources we were able to consider, along with the control variables we were able to integrate into the analysis. For example, while we were able to take into account marital status, we were

unable to control for the partner's employment situation of those who were married or cohabiting, which might shape intentions to leave the institution. Additionally, while we were able to control for the college of the respondent, we were unable to consider the specific disciplinary context in which the respondent operates, along with broader social support networks located outside of the department. The small sample size is related to a third limitation concerning the inability to apply a more comprehensive version of the job-demands-resources model. For example, we are unable to consider complex relationships, such as the possibility of departmental resources and demands creating gain spirals and/or loss spirals via job crafting and self-undermining behaviors (Bakker & Demerouti, 2017). A fourth limitation is that we were only able to achieve a response rate of 50%. While this rate is within the acceptable range, and common in these types of studies (e.g., Misra et al., 2012; Settles et al., 2012), it is possible that those who did not respond differ in some significant way from those who did. Lastly, we only consider the experiences of tenure-system STEM faculty members, and it is likely that other factors matter to those in other structural locations, such as full-time non-tenure track faculty members.

In conclusion, we build upon previous research by examining the connections between four facets of the departmental environment and turnover intentions among STEM tenure-system faculty members. Altogether, the findings reflect previous scholarship by pointing to gender similarities in how demands and resources operate in STEM faculty members' careers (Watanabe & Falci, 2016; Dorenkamp & Ruhle, 2019; Mudrak et al., 2018; Sabagh et al., 2018), while also pushing forward our understanding of STEM faculty turnover intentions by highlighting the importance of specific departmental demands and resources (positive department climate, department chair support, scholarly isolation, and perceived injustice). Understanding what undergirds these resources and demands can advance this line of research. In this vein, future work unpacking how departmental level mechanisms contribute to inequities in divisions of labor, especially those pertaining to service, will create a more vivid picture of the role of perceived injustice. Bringing attention back to gender may also sharpen our understanding of how these issues unfold. In particular, deepening our understanding of why demands and resources appear to shape outcomes in similar ways among men and women (Watanabe & Falci, 2016; Cech & Blair-Loy, 2014; Pedersen & Minnotte, 2018) will help elucidate how gender inequality unfolds in masculinized STEM contexts. It may be the case, for instance, that STEM women respond to gender inequality by creating systems of social support that at least partially mitigate the impacts of departmental demands. Alternatively, it may be the case that STEM women faculty members, cognizant of gender inequalities, expect to experience greater demands, and hence do not experience outsized penalties when they do encounter such issues. On the other hand, STEM men may be unprepared for the demands they encounter, thereby leading these demands to be as burdensome for them as they are for women. Another factor that may come into play is that STEM women, because they are more likely to encounter gender inequality in these contexts (Riffle et al., 2013; Callister, 2006; Xu, 2008), may be more attuned to factors, such as accurately noticing injustices and holding more nuanced evaluations of their department chairs. Regardless, future work that helps unpack the reasons for the patterns of gender similarity may be useful for understanding the gendered STEM context. Altogether, we are hopeful that future research will continue to apply the job-demands resources model to investigate the rich array of resources at the departmental level and how they shape faculty outcomes (Watanabe & Falci, 2016; Dorenkamp & Ruhle, 2019; Mudrak et al., 2018; Sabagh et al., 2018).

Compliance with Ethical Standards

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