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Why Academic STEM Mothers Feel They Have to Work Harder than Others on the Job

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ABSTRACT

Scholars have documented that the masculine work cultures characteristic of academic science, technology, engineering, and mathematics (STEM) disciplines create an unwelcome climate for women. One way academic STEM cultures can negatively impact women, especially mothers, is by shaping how hard they think they have to work on the job—a perception that can affect job satisfaction, stress levels, and attrition. This study assesses faculty member's reports of how hard they have to work on the job and the extent to which their sex, parental status, and academic discipline shape these reports. Survey data from roughly 300 tenure-line faculty members in a research university find that mothers in STEM disciplines perceive that they have to work harder than STEM and non-STEM fathers *and* mothers not in STEM disciplines. These differences remain net of controls for institutional tenure, rank, perceived job demands, work-family overlap, and time spent on job and family responsibilities. I interpret findings as evidence that STEM mothers encounter challenges to their competence—as mothers *and* as female experts in STEM disciplines with masculine cultures—that make them feel they must work harder than others. I discuss implications of findings for the experiences of women in academic STEM disciplines and policy reform intended to shift these perceptions.

KEYWORDS

masculine work culture; motherhood; STEM; work perceptions; academic STEM women

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INTRODUCTION

Despite gains in academic science, technology, engineering, and mathematics (STEM) positions since the 1970s, women in the U.S. still lag behind men in nearly every academic STEM field, especially in leadership positions (National Academy of Science, 2007). Commonly cited reasons for women's underrepresentation in STEM academic disciplines include implicit and explicit biases in favor of men, the lack of exposure of women to STEM-related opportunities and career information at a young age, women's primary responsibility for family caregiving, women's lack of access to research-related resources, as well as recruitment and promotion practices that favor men (Valian, 1999; Xie & Shauman, 2003; National Science Foundation, 2010; but see also Ceci & Williams, 2011). This study informs the ongoing discussion of the divergent experiences of female and male academics by focusing on a relatively overlooked source of this difference: faculty members' reports of how hard they have to work on their job. In particular, the study explores the impact women's and men's parental status may have on these reports. Previous research focusing on a non-academic U.S.-based sample of workers found that women report that they have to work harder on the job than men, net of individual and job controls (Gorman & Kmec, 2007). If the same holds true in academia or, more specifically, in academic STEM fields and female faculty members perceive they have to work harder than others, *regardless* of how well prepared they are or how well they manage non-job demands, women's job experiences may be unsatisfactory. Consequently, this study can offer new insight into barriers facing women in academic STEM jobs.

Faculty members' reports of how hard they must work on the job partly reflect their perceptions of disciplinary work cultures. In the U.S., the general culture of academia requires faculty members be "ideal" workers—someone who works long hours, is highly dedicated to the job, and has few (if any) interruptions from home, childbearing, or childrearing (Acker, 1990; Williams, 2001). In historically male-dominated academic STEM disciplines, work cultures emphasize "ideal" worker characteristics as well as other masculine qualities such as competition (Chesler & Chesler, 2002), an aggressive, status-seeking communication style (see Gunter, 2009), the minimizing of the display of non-masculine emotion or personal characteristics (Subramaniam & Wyer, 1998), and a linear career path (Ceci & Williams, 2011). As such, we might expect academic faculty, especially those in STEM disciplines, to report that they have to work hard on the job.

Faculty members' reports of how hard they must work can also partly reflect their parental status; being a parent can affect both work behavior and social expectations of those work behaviors. With regard to work behavior, the combination of paid work and raising children is time consuming. The challenges loom especially large for women who do a bulk of the childcare (Sayer & Gornick, 2011). In fact, mothers are significantly more likely than fathers to report being

overburdened with the combination of work and family (Offer & Schneider, 2011). With regard to social expectations of work behaviors, employers sanction mothers for combining paid work and family, believing them to be less competent, committed, on-time for work, and promotable than non-mothers and all men (Correll, Benard, & Paik, 2007). Academic motherhood is no different. Scholars have documented the difficulty women face combining motherhood and academic work given the “greedy” nature of both academia and family life coupled with higher education’s frequently inconsistent or absent institutional family accommodations (see Ward & Wolf-Wendel, 2004; 2012). What is more, academic mothers’ superiors tend to rate mothers as less involved in their jobs and less flexible than fathers (King, 2008). STEM mothers in particular report pressures balancing work and family (see Monosson, 2008; Fox, Fonseca, & Bao, 2011) and many women view an academic STEM career as a real barrier to motherhood (Ecklund & Lincoln, 2011).

STUDY OBJECTIVES

This study jointly considers three factors—academic STEM’s assumed masculine work culture, faculty members’ sex, and their parenthood status—to shed light on faculty members’ reports of how hard they have to work on the job. The analyses offer a timely and significant contribution to the growing body of literature addressing what federal agencies and scholars recognize as persistent gendered problems in academic STEM (for a recent review see Ceci & Williams, 2011). The paper empirically compares the reports of how hard roughly 300 tenure-line mothers, fathers, and non-parents in STEM and non-STEM departments in one U.S.-based research university think they have to work. Specifically, analyses address the research question: To what extent do faculty members’ sex, academic discipline (STEM versus non-STEM), and parental status affect their reports of how hard they have to work on the job?

The study context—a U.S. research-focused academic institution—is an ideal setting in which to address the proposed research question because of the similarities between faculty members’ jobs, regardless of their sex, parental status, and academic discipline. To begin, in such an institution nearly all tenure-track faculty members have a Ph.D. so nearly all academic faculty have equivalent job training. Second, academic tenure track jobs have a straightforward career path; nearly all tenure-line faculty members have a similar time frame (roughly 5-8 years) in which to achieve tenure. The pre-established tenure structure means that all faculty members, regardless of their sex or discipline, begin their academic careers with a similar understanding of their career trajectory. Third, despite being one institution governed by a common set of policies, universities are comprised of a variety of academic disciplines with different work cultures, some of which embody masculine attributes more than others. A setting with variation in work cultures is necessary to study the extent to which culture affects perceptions of how hard one must work. Finally, most academics have a workload comprised of teaching, research, and service so all faculty members are typically aware of their formal job requirements. In a research-focused university like the one I study here, where research expectations are high for all faculty, there is also little doubt about the relevance of research as a job requirement.

The national context is also relevant to the topic under study because in the U.S., as in most industrialized countries, science is culturally constructed as masculine. In the U.S. specifically, school systems have historically tried to accommodate women's supposed "people-centered nature" (see Heilman, 2012) and, until recently, neglected their interest in STEM by expanding their opportunities in programs supposedly connected to this "nature" (i.e., liberal arts, nursing, early childhood education) and actively discouraging their study of STEM in college (Charles, 2011; Monosson, 2008). Historical accommodation of women's "preferences" and support for women's pursuit of non-scientific careers may be some of the reasons that women continue to be underrepresented in academic STEM fields in the U.S.

In the next section I review the literature discussing academic STEM's masculine culture and the implications this culture imposes on women and mothers. In this discussion, I elaborate on the ways the culture impacts perceptions of how hard one has to work. Next I describe additional factors that affect reports of having to work hard. Following this I introduce the data used to answer my research question and method of data analysis. After discussing results—overall, STEM mothers think that they have to work harder than all fathers *and* mothers outside of STEM disciplines, differences that exist net of ability, experience, perceived job demands, time spent on job and family responsibilities—I explain the relevance of the analysis for advancing our understanding of the role that gendered work cultures play in shaping the relationship between motherhood and perceptions of having to work hard. I conclude with suggested directions for research and policy.

Consequences of Academic STEM's Masculine Culture for Women & Mothers

In academic STEM's masculine work culture, female scientists may be status inconsistent, meaning that their positions are incompatible with what society and the discipline itself thinks of as appropriate for a woman (see Charles, 2011; Peterson, 2010; Hirshfield, 2010). As a result of their gender-based status inconsistency, STEM women face serious negative consequences that affect their perceptions of how hard they must work on the job. The negative experiences related to gender-based status inconsistency in academic STEM fields will affect women with and without children differently because motherhood exacerbates women's status inconsistency within STEM. Becoming a mother makes visible a woman's femininity, her role as a nurturer, and increases expectations of her family caregiving responsibilities (Ridgeway & Correll, 2004). In addition to reducing a woman's "fit" in academic STEM disciplines, motherhood also intensifies negative assumptions of woman's professional competence, effort, and performance (see Benard & Correll, 2010). So while female scientists may face a double-bind, as women in a masculine-typed environment, being a mother scientist creates a *triple*-bind; mothers are measured against standards of gender appropriateness, masculine work ideals, and motherhood expectations (Peterson, 2010).

One consequence stemming from women's gender-based status inconsistency in academic STEM disciplines is that they may never "fit" the definition of success and to even attempt to "fit," they must work hard and exert emotional energy to control

their image. Researchers have found that in academic STEM settings, professional success means the suppression of stereotypically feminine behaviors and interaction styles in favor of stereotypically masculine ones (Dryburgh, 1999; Rhoton, 2011). For STEM women, this means professional success and being taken seriously is possible by acting more stereotypically male by, for example, laughing or smiling less, suppressing emotion, and downplaying or hiding family caregiving. Indeed, Ong (2005) found that female physics graduate students spent a great deal of time and energy concealing their personalities for fear of not being taken seriously by the men in their field. Given that society tends to conflate motherhood with a female identity, often to the extent that to be truly feminine, a woman has to be a mother (see Ireland, 1993; Ridgeway & Correll, 2004), the need to suppress femininity to be defined a success is even greater among STEM mothers. A recent analysis of women scientists in graduate school, post doctoral positions, and faculty positions (Steinke, 2013) revealed negative role conflict between the identity of woman—especially mothers or those who anticipated becoming one—and STEM scientist. This identity conflict is one more indicator of the added work required of women in STEM academic jobs. In European STEM industry jobs, women and mothers also perceive a lack of fit and role conflict to which they respond by changing their behavior in ways that required time and energy (Herman, Lewis & Humbert, 2013).

Another consequence of women's gender status inconsistency in STEM disciplines are challenges to their professional competence. Scholars have documented the prevalence of negative competence assessments and performance evaluations of women in male gender-typed jobs (see Heilman, 2012). More specific to academic STEM, Wenneras and Wold's (1997) study of the assignment of peer-review scores for postdoctoral fellowship applications found that a scientist's sex affected the rating of his or her scientific competence. Women had to be 2.5 times *more* productive than the average man to receive the same competence score (said differently, a woman had to publish roughly three extra papers in *Nature* or *Science* to earn the same score as her male counterpart). More recently, Lincoln and colleagues (2009) concluded that evaluators held women to a higher standard than men in the evaluation of their scientific work. In the selection of awards for the American Physical Society, a professional association for physicists, women were 65 percent less likely than men to win a professional award if the award committee chair was a man and men were nine times as likely to be award winners when a woman chaired the committee. Analyses of media depictions of women in science reinforce gendered assumptions of women's scientific incompatibility. The media exacerbates stereotypes that women are less competent than men in science by interviewing women scientific experts at significantly lower rates than men (Richardson, 2011), downplaying the expertise of female scientists, focusing on the conflicts faced by women scientists in balancing their work and personal lives, and presenting women more often as assistants than as leaders in the laboratory (Steinke, 1997). Because the workplace competence of mothers is already in doubt (see Correll et al., 2007), it is possible that mothers face even greater challenges to their competency than non-mothers in STEM.

Related to this, others may ignore or downplay the scientific contributions of women (Ridgeway, 2001; Valian, 1999; Heilman & Haynes, 2005; Ridgeway & Correll, 2004). To illustrate, individuals rated the same performance as better when told it was done by a man than when told it was completed by a woman (Bowen, Swim, & Jacobs, 2000) and when a man and woman jointly produced an exceptional product, they assumed the man contributed more than the woman did (Heilman & Haynes, 2005; Ridgeway & Correll, 2004). Because they already suffer negative performance evaluations, mothers are especially susceptible to the problem of the invisibility of their contributions.

In response to the barriers stemming from their gender status inconsistency in STEM disciplines, STEM mothers may view how hard they must work on the job differently than other academics do. Specifically, STEM mothers may view impression management or the "checking" of feminine emotion as part of their job (see Steinke, 2013). The suppression of non-masculine emotion requires work. What is more, mothers in STEM disciplines may feel an additional work burden of trying to portray "masculine" competence without violating normative assumptions of how a mother ought to be (i.e., feminine, caring, etc.) (see Benard & Correll, 2010). If STEM mothers face challenges to their professional competence regardless of their ability or preparation, they may feel the need to prove their competence. To do this, they may feel it necessary to hide failures and routinely display success, two behaviors that require work. STEM mothers may also approach their jobs with less confidence than non-mothers and men, especially if they receive negative feedback about their ability to perform a task (Heilman, Lucas, & Kaplow, 1990). Finally, as "gender outsiders" whose contributions may be overlooked or ignored, STEM mothers might think more is required of them in order to be taken seriously or to be seen as competent as a man whose work receives more attention (see Foschi, 2000; Major, McFarlin, & Gagnon, 1984; Heilman, 2012). In short, STEM mothers are not simply scientists. Instead, they are scientists who may also feel compelled to respond to their parental and gender disciplinary inconsistency. This response can be exhausting and, in turn, heighten STEM mothers' perceptions of how hard they must work.

Controls

Gender-typed disciplinary cultures, parenthood, and one's sex affect perceptions of how hard individual faculty members have to work on the job. Additional factors also affect these perceptions by impacting actual work loads and the time one has available to perform job tasks. For example, a faculty member's institutional tenure (i.e., years on the job at their present institution), should affect perceptions of how hard they must work. Longer tenure may increase a faculty member's perceptions of how hard he or she must work since those with longer tenure may do a lot or be asked to contribute a lot (i.e., serve on committees, produce grants, etc.). On the other hand, institutional tenure may reduce these perceptions; those with longer tenure may think they have "figured out" what is required of them meaning they may not have to work at figuring out what they must do. Academic rank ought to be related to perceptions of having to work hard; untenured faculty members may think they have to work hard because their progress tends to be closely monitored and they are usually held to specific standards of productivity.

However, advanced rank may be associated with perceptions of having to work hard because the service and mentoring burdens may increase with rank, especially among women (Wilson, 2012).

Perceived job demand levels should affect a faculty member's report of how hard they must work on the job: demanding jobs will be seen as requiring more hard work than less demanding ones. The amount of time spent teaching, doing service work, mentoring, and conducting research also ought to be related to how hard a faculty member thinks he or she has to work. Higher loads of these required tasks, and subsequently greater time spent doing them, is likely to be associated with higher perceptions of having to work hard. Since women, especially those in STEM disciplines, report doing more time in non-research related job tasks (Callister et al., 2009), controlling for time spent on all job tasks is necessary to properly explore sex differences in perceptions of having to work hard. Feeling valued because of one's research contributions might affect reports of how hard one has to work on the job since workers tend to view their job as being easier when they feel valued (Demerouti et al., 2000).

Family responsibilities might affect reports of how hard one has to work on the job. Individuals tend to report having to put in more work or effort when they are tired, and family caretaking or balancing work with home might result in such fatigue (Meijman et al., 1986). On average, women devote more time than men do to housework and child care, and these activities might leave them tired and feeling that they must work hard on the job (Sayer & Gornick, 2011). If female (and mother) academics do more at home than male academics, they may report having to work harder on the job because they do not have the energy to complete their job tasks.

In sum, it is necessary to control for factors (i.e., institutional tenure, academic rank, feeling valued because of one's research contributions, marital status, age of children in home, time spent on family and household responsibilities, perceived job demands, time spent on job tasks, and family to work spillover) discussed above as they impact reports of having to work hard. In the case of academic rank, time spent doing job tasks, marital status, weekly family and home responsibilities, and home-work interface, mothers, fathers, and non-parents report different levels of these factors.

DATA AND METHODS

To answer my research question (to what extent do faculty members' sex, academic discipline (STEM versus non-STEM), and parental status affect their reports of how hard they have to work on the job?) I draw on data from the 2011 Faculty Caregiving and Workplace Culture survey, a unique internet-based survey administered at a large, multi-campus public university located in northwest U.S. The university's main campus enrolls roughly 20,000 undergraduate and graduate students. Women are 25 percent of lecturers and tenure-track STEM faculty at the university and they hold 11 percent of STEM administrative and leadership positions (e.g., dean, department head, distinguished chairs).¹

The appendix provides details of the survey administration. Of the 840 tenure-line faculty eligible for the survey, 313 participated in the internet survey, yielding a response rate of 37 percent. I omitted 14 (or roughly 4.5 percent of the sample) faculty members holding administrative positions (i.e., dean, associate dean, but not department heads or distinguished chairs so the sample still includes women in academic leadership positions) since their duties and expectations differ from non-administrative faculty members. Non-respondents were 31 percent female (n=164), compared to respondents who were 42 percent female (n=131), so the sample is proportionally more female than the pool of tenure-line faculty at the university. Of respondents, 45 percent (n=133) were STEM faculty and 31 percent (n=40) of female respondents were STEM faculty compared to 56 percent of (n=93) male respondents. The proportion of STEM tenure-line faculty in the university is 49 percent, so the survey slightly under-represents STEM faculty. The sample includes data from tenure-line faculty members in all of the university's 25 STEM departments, although the sample contains from as few as one tenure-line respondent per department to as many as nine respondents. The sample also includes respondents in nearly all of the university's non-STEM departments (as explained in the appendix, there are no Business School respondents). The sample contains from as few as one tenure-line faculty respondent in a non-STEM department to a maximum of 22 respondents.

Dependent Variable

I measure faculty members' perceptions of how hard they have to work on the job with their response to the following statement "My job requires me to work very hard" (1= strongly disagree, 2=disagree, 3=agree, 4=strongly agree). Because the dependent variable is ordinal, I estimate ordinal logistic regression models.²

Independent Variables

The principal independent variable is a set of dichotomous variables indicating a faculty member's *sex* (woman=1, man=0), *parental status* (parent=1, non-parent=0), and *academic discipline* (STEM field=1, non-STEM field=0). I classify respondents as follows: STEM mother (omitted category), STEM father, STEM childless woman, STEM childless man, non-STEM mother, non-STEM father, non-STEM childless woman, or non-STEM childless man. "STEM mother" is the omitted category for the independent variable. So, for example, the coefficient on "STEM father" is a comparison of the perceptions of having to work hard of STEM fathers compared to STEM mothers.

Control Variables

Models include a continuous measure of self-reported *years at present institution (institutional tenure)*. Models also include a measure of *academic rank*, coded 1=assistant professor, 2=associate professor, 3=full professor, 4=distinguished full professor (the highest university rank). I could not estimate models with a dichotomous tenure indicator since it was collinear with one of the categories of the independent variable of interest. Respondents reported their level of agreement with the following statement: "Too many demands are made of me on my job" (coded: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree) and I included this response as an indicator of *perceived job demands*. Models include

reported *weekly hours* (in a typical semester) spent doing: research, service, teaching, and mentoring/advising (for each activity, coded: 0=no hours, 1=1-3, 2=4-6, 3=7-9, 4=10-12, 5=13-15, 6=16-18, 7=19-21, 8=22-24, 9=25-27, 10=28-30, and 11= 31+ hours). I measure *perceived appreciation for research contributions* with a respondent's level of agreement with the following statement: "I feel appreciated and valued by departmental colleagues for my research work" (coded: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree).

In addition, I add to models an indicator of *marital status* (coded: 1=married or cohabiting, 0=not). If a respondent is a parent, I include a dichotomous variable coded "1" if a respondent has *pre-school aged children (those under 5) in the household* and coded "0" if the person has no pre-school aged children.³ I account for the number of weekly hours (in a typical semester) the respondent spends doing *caregiving for children/ elderly relatives* and *household chores* (for each activity, coded: 0=no hours, 1=1-3, 2=4-6, 3=7-9, 4=10-12, 5=13-15, 6=16-18, 7=19-21, 8=22-24, 9=25-27, 10=28-30, and 11= 31+ hours). I also include a measure of *reduced job effort due to home responsibilities* with the response to a question about the frequency in the past year with which a respondent's "personal and family responsibilities have reduced the effort she or he can devote to the job" (coded: 1=never, 2=a few times per semester, 3=a few times per month, 4=a few times per week, and 5=daily). Another measure indicates the extent of *home distractions on the job* with a measure of the frequency with which personal or family life problems distracted a faculty member at work (coded: 1=never, 2=a few times per semester, 3=a few times per month, 4=a few times per week, 5=daily). A final measure indicates the extent to which a faculty member reports that home life helps him or her relax and feel ready for the next day's work (coded: 1=never, 2=a few times per semester, 3=a few times per month, 4=a few times per week, 5=daily).

RESULTS

STEM Mother versus Other Faculty Differences

Table 1 displays descriptive statistics for variables used in analyses. As noted in the introduction, because academia's general culture rewards "ideal" work behavior, we might expect faculty members to be especially likely to report that they have to work very hard on the job. This expectation is true. Employed respondents in a different U.S.-based sample in a broad range of jobs (some professional, some not) responded to the same statement analyzed here: "My job requires that I work very hard" (1=strongly disagree to 4=strongly agree). The average score reported for this sample was 3.29 (see Gorman & Kmec, 2007, Appendix A). The average response to the same statement in the present academic sample is 3.60. I turn next to Panel A (Table 1) to discuss sex and disciplinary differences in reports of having to work very hard on the job. First, we see that women (mean = 3.65) think they have to work harder on the job than do men (mean=3.47) (mean difference significant at the $p < .01$ level), a finding consistent with other analyses of workers (see Gorman & Kmec, 2007). Second, STEM faculty (mean=3.71) think they have to work harder on the job than non-STEM faculty (mean=3.50), although the mean difference is only significant at the $p = 0.06$ value). A finding we would expect given the heightened work expectations characteristic of academic STEM disciplines.

Table 1. Descriptive Statistics

Panel A	Women	Men			STEM	non-STEM		
Having to work hard on the job ^a	3.65 (0.53)	3.47 (0.62)			3.71 (0.48)	3.50 (0.60)		
Panel B	Mothers		Fathers		Childless Women		Childless Men	
	STEM	Non-STEM	STEM	Non-STEM	STEM	Non-STEM	STEM	Non-STEM
Work hard on job	3.80 (0.41)	3.57 (0.59)	3.51 (0.63)	3.31 (0.71)	3.71 (0.47)	3.63 (0.54)	3.58 (0.60)	3.47 (0.51)
Inst. tenure (yrs)	11.96 (6.71)	10.23 (5.47)	13.91 (10.55)	10.71 (8.21)	11.54 (9.17)	10.10 (8.42)	22.49 (13.71)	16.38 (12.20)
Rank	2.16 (0.80)	1.95 (0.68)	2.14 (0.82)	2.09 (0.85)	1.86 (0.66)	1.85 (0.83)	2.84 (0.76)	2.26 (0.99)
Perceived job demands	3.29 (0.86)	3.12 (0.84)	2.92 (0.76)	3.06 (0.78)	3.08 (0.76)	3.19 (0.82)	2.94 (0.91)	2.94 (0.85)
Weekly hours doing: ^b								
Service	2.17 (1.09)	3.26 (2.18)	3.30 (2.22)	3.47 (3.17)	3.00 (2.82)	3.93 (2.52)	3.23 (2.49)	3.09 (2.45)
Research	7.00 (3.25)	3.50 (2.44)	7.23 (3.28)	6.08 (3.27)	8.00 (3.46)	5.56 (3.18)	7.32 (3.60)	7.27 (3.16)
Teaching	5.28 (2.75)	5.45 (2.16)	5.17 (2.71)	4.73 (2.14)	6.79 (3.82)	5.49 (2.72)	5.00 (3.52)	5.19 (2.46)
Mentoring	2.76 (1.79)	2.98 (1.77)	3.39 (1.97)	2.46 (1.76)	3.57 (3.23)	3.19 (2.37)	2.97 (1.99)	2.85 (1.50)
Perceived appreciation for research cont.	2.68 (0.72)	2.82 (0.89)	2.48 (0.86)	2.83 (0.87)	2.64 (0.59)	2.69 (0.82)	.271 (0.90)	2.72 (0.81)
Married/cohabiting	0.88 (0.33)	0.93 (0.23)	0.95 (0.23)	0.81 (0.40)	0.36 (0.50)	0.74 (0.44)	0.92 (0.28)	0.83 (0.38)
Kid < 5 in home	0.23 (0.43)	0.33 (0.48)	0.32 (0.48)	0.27 (0.45)	--	--	--	--
Weekly hours doing: ^b								
Care	5.17 (4.15)	6.47 (4.45)	3.13 (2.92)	6.16 (3.69)	0.33 (0.01)	0.33 (0.01)	0.24 (0.01)	0.24 (0.01)
Chores	3.36 (2.23)	3.70 (2.04)	3.30 (2.39)	3.31 (1.41)	2.64 (1.65)	3.13 (2.39)	3.22 (1.59)	2.48 (1.41)
Less effort b/c of home	3.27 (1.49)	2.91 (1.14)	3.02 (1.36)	3.57 (1.22)	2.36 (1.22)	2.20 (1.04)	2.50 (1.16)	2.38 (1.04)
Home distract job	2.12 (0.99)	2.27 (0.81)	2.19 (1.00)	2.26 (1.08)	2.00 (0.78)	2.03 (0.86)	2.25 (1.05)	2.41 (0.91)
Home helps relax	3.65 (1.20)	3.84 (1.19)	3.81 (1.37)	3.39 (1.25)	3.86 (1.10)	3.98 (0.98)	3.91 (1.36)	4.03 (1.14)
	n=26	n=45	n=56	n=37	n=14	n=43	n=37	n=35

Notes: ^a coded so higher values indicate higher standing. ^b 0=no hours, 1=1-3, 2=4-6, 3=7-9, 4=10-12, 5=13-15, 6=16-18, 7=19-21, 8=22-24, 9=25-27, 10=28-30, and 11= 31+ hours per week. Shaded cells indicate value significantly different from STEM mothers

Panel B (Table 1) includes faculty members' reports of having to work hard while taking into account their sex, parental status, and academic discipline. Given my interest in comparing STEM mothers to other faculty members, I focus my attention on the comparison of STEM mothers with all other faculty members. Shaded cells indicate when a faculty member's mean on a given variable is statistically significantly different from the mean for STEM mothers using a t-test to compare group means. STEM mothers' perceptions of how hard they must work are statistically similar to those of childless women and childless STEM men. However, I observe greater perceptions of having to work hard among STEM mothers compared to all fathers, non-STEM mothers and men without children outside of STEM fields.

I now turn to a discussion of differences in control variables across sex-parental status-discipline groups. For the most part, I observe more similarities than differences among STEM mothers and other faculty members on job, and individual attribute measures. These similarities demonstrate that compared to other faculty members in and outside of STEM fields, STEM mothers do not come to their jobs with very different experiences at home and on the job, they have similar work patterns. For example, like other faculty members, STEM mothers view their jobs as relatively demanding, feel moderately appreciated for their research contributions, most have tenure, and they spend about 20 hours doing research, 14 hours teaching, and 7 hours mentoring per week. At home, like other faculty members, STEM mothers engage in about 7-9 hours of chores per week, most are married, and their family/personal lives distract them at work only a few times per semester. Like most others (non-STEM childless men are the exception), STEM mothers report that their home helps them relax and prepare for work more than a few times per week.

The greatest difference between STEM mothers and other faculty members is in self-reported time spent doing service work. STEM mothers report engaging in significantly *less* service work per week during a typical semester than all other faculty members (they report similar service levels as STEM childless women). STEM mothers report engaging in *more* research per week than nearly all non-STEM women, but the same levels as men across disciplines. Another area where STEM mothers differ from most other faculty members is in time devoted to caregiving. STEM fathers and men and women without children in all disciplines report spending *less* time family caregiving on a weekly basis than STEM mothers. STEM mothers and non-STEM parents of both sexes report similar family caregiving responsibilities. STEM mothers report more frequent reductions to their work effort due to home responsibilities than non-parents in both disciplines, but similar reductions as parents of both sexes in all disciplines.

Multivariate Results

Ordinal logistic regression models in Table 2 first present a baseline model (Column A) regressing perceptions of having to work hard on a faculty member's sex, parental status, and academic discipline. The complete model (Column B) explores this relationship net of controls for institutional tenure, rank, perceived job demands, perceived appreciation for research contributions, hours spent on job and

family tasks, and work-family connections. I present odds ratios; odds ratios above 1.00 indicate greater perceptions of having to work hard compared to STEM mothers (the omitted category of the independent variable) while odds ratios below 1.00 indicate lower perceptions of having to work hard than STEM mothers.

Table 2. Odds Ratios from Ordinal Logistic Regression of Reports of Having to Work Very Hard on Predictor Variables

	Column A Baseline Model	Column B Full Model
Sex-Parenthood-Discipline		
STEM mother (omitted)	--	--
STEM father	0.32* (0.18)	0.16* (0.14)
STEM childless female	0.63 (0.49)	0.70 (0.77)
STEM childless male	0.42 (0.25)	0.33 (0.31)
Non-STEM mother	0.38 ^t (0.23)	0.19 ^t (0.17)
Non-STEM father	0.17** (0.10)	0.08** (0.07)
Non-STEM childless female	0.48 (0.28)	0.45 (0.44)
Non-STEM childless male	0.25* (0.15)	0.24 (0.22)
Controls		
Institutional tenure		0.99 (0.02)
Rank		1.42 (0.40)
Perceived job demands		2.42*** (0.53)
Weekly hours on research		1.04 (0.06)
Weekly hours on teaching		1.03 (0.07)
Weekly hours on service		1.11 (0.08)
Weekly hours mentoring/advising		1.00 (0.09)
Perceived appreciation. for rsch. contributions		1.15 (0.23)
Married/cohabiting		1.52 (0.74)
Children under 5 in home		4.42* (2.71)
Weekly hours caregiving		1.10 (0.08)
Weekly hours doing chores		0.92 (0.08)
Reduced effort due to home resp.		0.86 (0.14)
Home distractions on job		1.01 (0.22)
Home is relaxing		0.92 (0.14)
Intercept 1	-6.74	-2.89
Intercept 2	-4.21	-0.34
Intercept 3	-1.41	2.24
n	285	211
Log likelihood	-227.31	-133.87
Pseudo R ²	0.03	0.16

Notes: [†]p<.10; *p<.05; **p<.01;***p<.001

The odds of reporting stronger agreement with the statement "My job requires me to work very hard" are significantly *lower* (i.e., all odds ratios are below 1.00) for fathers in STEM and non-STEM disciplines compared to STEM mothers (see Column A). Specifically, the odds a STEM father reports greater agreement that his job requires him to work very hard are about 68 percent *less* than the odds for a STEM mother (odds ratio=0.32, p -value < .05). The odds a father outside of a STEM discipline reports that his job requires him to work very hard are about 83 percent *less* than the odds for a STEM mother (odds ratio=0.17, p <.01). STEM mothers and mothers in non-STEM disciplines also differ in their perception of having to work hard on the job; STEM mothers view themselves as having to work harder than do non-STEM mothers (odds ratio 0.38, p -value=0.06). Men without children in non-STEM disciplines have lower perceptions of having to work hard than those of STEM mothers; the odds a childless man in a non-STEM discipline reports greater agreement that his job requires him to work very hard are about 75 percent *less* than the odds for a STEM mother (odds ratio=0.25, p <.05). STEM mothers and men and women without children in STEM and non-STEM women without children do not differ in their baseline perceptions of how hard they must work on the job.

The full model (Column B) includes controls for individual, job, and family measures. Net of these controls, I observe a similar pattern of findings in the link between reports of having to work very hard on the job and a faculty member's sex, parental status, and discipline. Specifically, net of all controls the odds a STEM father reports greater agreement that his job requires him to work very hard are about 84 percent *less* than the odds for a STEM mother (odds ratio=0.16, p <.05). The net odds a father outside of a STEM discipline reports higher levels of agreement that his job requires hard work are about 92 percent *less* than the net odds for a STEM mother (odds ratio=0.08, p <.01). STEM mothers and mothers in non-STEM disciplines also differ in their perception of how hard they must work on the job when holding constant all controls, non-STEM mothers' odds of reporting stronger agreement with the statement "My job requires that I work very hard" are roughly 81 percent (odds ratio=0.19, p =.06) lower than STEM mothers' odds. The presence of controls fully accounts for the significant difference between perceptions of having to work hard between STEM mothers and men without children in non-STEM disciplines. In the full model, as in the baseline one, STEM mothers, STEM non-parents of both sexes, and non-STEM women without children do not differ in their assessment of having to work hard.⁴

Surprisingly few control variables affect perceptions of having to work hard on the job. I discuss only the statistically significant controls here. Perceived job demands are strongly linked to faculty members' perceptions of how hard she or he must work; faculty members who think their jobs are demanding also report stronger agreement with the statement that they must work hard, net of all controls (including the number of hours they spend on both job and family tasks in a typical week). A one-unit increase in perceived job demands yields roughly a net doubling of the odds that a faculty member reports that he or she must work very hard. That the differences in the outcome between STEM mothers and others (who all report similar levels of perceived job demands (see Table 1)) remain net of this statistically and substantively significant control suggests that analyses are not

simply capturing a difference in perceptions of job tasks or demands but instead, what faculty members think they must do to get their job done. The presence of pre-school aged children at home significantly increases faculty members' perceptions of having to work hard on the job. The net odds a faculty member with a child under the age of 5 at home reports they must work very hard, are more than five times as great as a faculty member without pre-school aged children at home.

DISCUSSION

This study explored how faculty members' sex, parental status, and academic discipline affected reports of how hard they must work on the job. It did so by drawing on a sample of tenure-line faculty members in a U.S. research university. I discuss the two central findings from analyses in detail below.

STEM mothers versus fathers. The first major finding to emerge is that STEM mothers think they have to work harder than all fathers, even when they have similar institutional tenure and rank, equivalent perceived job demands, similar family responsibilities, and they devote similar amounts of time to job and home tasks. The STEM mother-father difference coupled with the STEM mother versus childless man similarities in perceptions of having to work hard on the job is in line with previous research documenting employers' tendencies to hold fathers to more lenient standards at work, allowing them to be late more often and absent more frequently than men without children and women (Fuegen et al., 2004; Bridges, Etaugh, & Barnes-Farrell, 2002). If fathers experience lenient standards at work, it makes sense that they do not report having to work as hard as mothers whose commitment and competence is frequently challenged at work (Ridgeway & Correll, 2004). As past research has also shown, employers view fatherhood as a signal of work commitment and qualities associated with an "ideal" worker (Budig & Hodges, 2010). Employers, however, tend to view motherhood as antithetical to paid work. If fatherhood is synonymous with the "ideal" worker, a father is not likely to think that he has to work hard to "prove" himself—proof that his parental status already signals. In contrast, motherhood gives off negative "signals" that make a mother feel that she must work harder to get noticed and prove her abilities, behaviors that likely make her feel that she has to work very hard on the job.

STEM versus non-STEM mothers. The second major finding to emerge from analyses is that STEM mothers think they have to work harder than similarly situated mothers in non-STEM disciplines, net of individual, job, and family-level controls. Whereas others have found mother-father differences in reports of having to work hard or related outcomes, this is among the first set of analyses to find differences in mothers' reports of having to work very hard across academic disciplines. The within motherhood difference warrants further discussion because it suggests something unique about academic STEM disciplinary work cultures — cultures that reward long hours, job dedication, limited family interruptions, competition, and disregard for the display of non-masculine emotion—that matter for mothers. Specifically, I interpret this disciplinary difference among mothers to mean that mothers' status inconsistency is greatest in symbolically masculine STEM academic settings. This heightened status inconsistency also exacerbates

stereotypes of mothers' lack of competence and work dedication (Britton, 1997, 2000, 2011; Ridgeway & Correll, 2004; Settles, Cortina, Malley, & Stewart, 2006; Valian, 1999; Whittington, 2011). As a result of being reminded of their triple-bind in masculine STEM disciplines, mothers think that they have to work very hard. That is, on top of formal job duties, STEM mothers may feel they must "check" non-masculine emotion, constantly prove their competence, and perform well all of the time in order to be taken seriously. These perceptions, subsequently, lead STEM mothers to feel as if they have to work harder than mothers in non-STEM fields.

Finding motherhood differences across academic disciplines contributes to the research exploring the dynamics of both gender and motherhood in academic settings. In particular, it is evidence that disciplinary expectations of what an "ideal" worker looks like are relevant to mother's experiences in academic STEM. Turco (2010) argued that when members of a particular group—mothers both in her case and mine—do not fit the image of an "ideal" worker, they face scrutiny and pressures, even when they as individuals adequately perform their job. More recently, Bleijenbergh, van Engen, and Vinkenburg (2013) found that male deans of Dutch liberal arts and science-centered universities agreed that the ideal worker standard did not allow room for caregiving and they assumed that women, regardless of their academic field, could not meet the "ideal" worker standard. Future research geared toward understanding women's presence in academic STEM fields must pay closer attention to the way images of "ideal" workers matter for women's experiences on the job.

Alternative Interpretations of Findings

An alternative interpretation of the observed differences in perceptions of having to work hard is that the differences originate from item-response bias. STEM mothers may systematically and intentionally *inflate* their reports while fathers may systematically and intentionally *deflate* theirs. It is possible that STEM mothers may feel like they have to say they worked harder than others to justify to themselves and others, who may negatively judge them for their choice to combine family with a "masculine" job, the time they spend on the job and not with their families. Of course, it is just as plausible for STEM mothers to deflate their response relative to men so they give the impression that they are "doing it all." The faculty women Drago and colleagues (2006) studied wanted to give this impression by hiding family responsibilities at work. How item response bias matters for the observed STEM and non-STEM mother difference is less clear; it may be that STEM mothers *inflate* their perceptions of how hard they have to work relative to non-STEM mothers because of the pressures related to being gender status inconsistent in masculine academic disciplines (Heilman, 2012). On the other hand, STEM mothers may *deflate* their perceptions relative to non-STEM mothers, reporting that they do not have to work hard to prove that they "fit" in a masculine setting.

Regardless of their discipline or parental status, men may systematically *deflate* their perception of having to work hard to appear as though their competence makes their job easy for them. At the same time, it is just as likely that men would inflate their reports so they appear "masculine" by working hard (Heilman, Block, Martell, & Simon, 1989). In short, the pattern of response bias among female and

male faculty members does not suggest one clear-cut direction of response. Further research attention is necessary before concluding that item response bias explains the observed findings.

Finally, it may be that survey respondents are different from non-respondents in a way that affects observed perceptions of how hard one thinks they have to work. Although the sample contains respondents from all eligible STEM and non-STEM departments and respondents from roughly the same share of STEM and non-STEM departments as the entire university, maybe only STEM mothers who feel pressure to perform responded to the survey out of an interest in changing their work environment (I indicated that I would share study findings with administrators). Alternatively, the STEM mothers who feel the most job pressures may not have responded because they lacked the time to complete the survey. Again, survey response bias could have led to the over-estimation of STEM mothers' perceived job requirements as much as it could have underestimated them.⁵

CONCLUSIONS

Workplaces have come a long way from legally banning pregnant women and mothers from holding jobs (Dobbin, 2009) and from de facto bans on women from studying lab science (see Monosson, 2008). Today mothers face different but no less discouraging workplace barriers. Employers tend to view mothers as being less competent at work than non-parents and fathers (Crosby, Williams, & Biernat, 2004; Fuegen et al., 2004; Correll et al. 2007; Ridgeway & Correll, 2004; Williams, 2004). These perceptions, coupled with negative assumptions about women in STEM disciplines with masculine work cultures, ultimately lead to the sex-parenthood-discipline differences in reports of having to work hard reported here.

A scientist interviewed by Monosson (2008, p. 3) said it best: "The push to get more women in science and engineering has ignored the elephant in the room—motherhood." So the question that remains is how the academic scientific community will respond to STEM mothers' greater reports of having to work very hard. The National Science Foundation (NSF) recently responded to the call for support for the combination of parenthood and research science by allowing the postponement of grants for parental leave, permitting "virtual travel" to panels to reduce reviewers' childcare burdens, and allowing grant funds to cover laboratory maintenance for a scientist on parental leave (The White House, 2011). If women and mothers have an inflated sense of feeling that they have to work hard, the NSF policy change allowing grant postponement following the birth or adoption of a child may actually have the unintended consequence of making a mother think she has to work even harder to "make up" time out of the lab.

The present analyses suggest additional changes may be necessary to improve mothers' experiences in academic STEM disciplines. I propose that to impact women's and mothers' perceptions of what is required of them at work will take a disruption of academic STEM's masculine tendencies (Ely & Meyerson, 2010; Peterson, 2010). As Ely and Meyerson (2010) pointed out, organizations (in this case, universities) can play a role in reshaping masculine identity-construction processes common at work. In their study of off-shore oil rigs, Ely and Meyerson

found that policy changes to enhance safety had the unintended consequence of “de-masculinizing” work norms. Universities could take intentional steps to “de-masculinize” STEM disciplines by reorienting work goals to be less about self-validation (i.e., personal success as a scientist) and more about the success of the collective (i.e., department or unit). One way universities can do this is by highlighting the collective accomplishments of departments (e.g., total grant activity per year) in addition to the individual ones. Another way universities can “de-masculinize” STEM disciplines is by allowing expression of failure, requiring faculty to report unfunded grants or manuscripts submitted and rejected as part of the annual review process. A third way universities can accomplish “de-masculinization” is to acknowledge that all faculty members, regardless of their rank, can benefit from assistance and transparent evaluative criterion. The establishment of a formal advisory and evaluation system for faculty of all ranks and faculty research groups where faculty members present imperfect works in progress for faculty comment are some ways to formalize such assistance.

Study Limitations

In order to place the current findings in perspective, I must address data limitations. Data come from a single, U.S. university so all faculty are subject to the same university policies, leadership, and university climate. As a result, the study cannot account for variation in university policies that could affect reports of having to work very hard. Nor can the findings be generalized to non-research focused universities or those outside of the U.S. I have already indicated that women in the U.S. may be especially susceptible to feeling gender status inconsistent in academic STEM fields; women’s and mothers’ experiences in STEM in some other countries may be different so the cross-cultural generalizability of results remains an empirical question. Although the sample contains close to 300 faculty members, data from a larger share of the university’s faculty would be beneficial. Finally, the data do not include a measure of indicating the faculty members’ comparison group when answering the question about working hard. Future research could address these limitations by surveying faculty in multiple university settings including in different countries, and by asking additional questions about social comparison groups at work.

Directions for Future Research

Despite genuine attempts to bring women into academic STEM fields, women and mothers are still not fully integrated into STEM disciplines suggesting society still lacks a complete understanding of the mechanisms driving women’s and mothers’ absence. For this reason, future research should continue to pay attention to mothers’ sense of how hard they think they must work on the job. These perceptions are understudied, yet they offer a new angle from which to understand how women and men can differently experience their jobs. Researchers should also consider the career consequences of STEM mothers’ perceptions of having to work hard on the job. Do STEM mothers report greater levels of stress and job burnout as a result of thinking they have to work harder than other faculty members? Do these perceptions affect women’s job satisfaction and their decision to persevere in academic STEM positions? These are especially timely questions given recent attempts by universities to retain female STEM scientists.

Women's underrepresentation in academic STEM fields will likely continue if mothers think they have to work harder than men yet, in general, they continue to be out-earned by men and promoted slower than their male peers (see Ceci & Williams, 2011). We also stand to make research and policy contributions by focusing on the extent to which gendered work cultures and disciplinary images of "ideal" workers pattern faculty members' understandings of what is required of them on the job.

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ENDNOTES

¹ Following the university's classification, I label the following as STEM disciplines: animal science, architecture, astronomy, biology, chemistry, crop and social science, entomology, engineering, food science, mathematics, natural resource science, pharmacy, plant pathology, physics, statistics, and veterinary science.

² The question was asked early on in the survey (question 5) immediately following questions asking a respondent about their work involvement and effort.

³ A continuous measure of the number of children in the household was collinear with one of the categories of the independent variable so I could not include it in models, but parents of children older than 5 are included in the model.

⁴ If STEM mothers are punished for being gender inconsistent in highly male settings, we might expect STEM mothers' reports of having to work very hard to be *lower* in STEM fields with the most women. I analyzed (not shown) a subsample of faculty members who worked in the most female STEM departments (those with at least 60 percent women). The differences in reports of having to work very hard between all fathers, non-STEM mothers, and STEM mothers are similar to those presented in Table 2: STEM mothers in the more female STEM departments still report higher levels of having to work very hard than non-STEM mothers and all fathers. I interpret this finding with some note of caution; of the 25 STEM fields represented in my sample, only three were comprised of at least 60 percent women. This finding is not surprising because regardless of their numerical sex composition, STEM fields are symbolically masculine—the culture of STEM is built around a male model that rewards masculine work behavior. So even in a local setting where women are more than a small minority, the expectations of STEM academics are still "masculinized" (Irvine & Vermilya, 2010).

⁵ Analyses (not shown) find that the non-tenured STEM mothers' reports of having to work very hard are similar to tenured STEM mothers' reports, suggesting that analyses are not simply capturing the perceptions of STEM mothers who survived the tenure process. Thus, I am not likely to be underestimating the effects of parenthood and sex on the outcome, as "burnt out" STEM mothers already left academia through the tenure process.

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