Perceptions of the Research Climate in Universities and National Research Institutes: The Role of Gender and Bureaucracy in Three Low-Income Countries

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Abstract: This article examines the relationship between sex and sector of employment and perceptions of the research climate among a sample of researchers in three low-income areas: Ghana, Kenya, and Kerala India. Using data gathered in 2010 from scientists working in universities and national research institutes, we address the following questions: 1) Are there differences in men's and women's assessment of the research environment in terms of their satisfaction with funding, ratings of problems associated with communication and coordination, and sense of autonomy? 2) Do contextual factors—primarily sector of employment but also controlling for home region—account for these differences? 3) Does the effect of sex vary across sector and location? 4) Are there other factors—family status, education, and experience—that mediate the relationship between sex, context and perceptions of the work environment? Findings indicate that female scientists' satisfaction with funding is governed by national context rather than institutional context, while their sense of autonomy and experience with problems related to communication and coordination is governed by institutional contexts. By engaging with the literature on the gendered nature of bureaucracy, our results provide insight into the features of organizations that shape male and female researchers' experiences.

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Research on scientific careers generally indicates that women and men have disparate experiences and follow separate, often unequal career paths (Fox 2010; Fox and Mohapatra 2007; Xie and Shauman 2003). This conclusion is typically gaged through aggregated measures of gender differences in numerical presence in scientific fields (Fox and Colatrella 2006; Long and Fox 1995), publication productivity (Fox 2005; Long 1992; Long and Fox 1995; Miller et al. 2012) and professional rank (Benschop and Brouns 2003; Fox and Colatrella 2006; Long and Fox 1995).

To better understand these differences, a small but growing body of literature examines men's and women's subjective experiences with and perceptions of the work and research climate (Cech and Blair-Loy 2010; Bronstein and Farnsworth 1998; Fox 2010; Fox and Mohapatra 2007; Smith-Doerr 2004; Todd et al. 2008). Consistent with the conclusions drawn from the more formal indicators of scientific involvement noted above, studies examining assessments of the research environment find that men and women, even when working in the same organization, often have different experiences. Women are more likely than men to report unfair treatment in a variety of institutional processes (Bronstein and Farnsworth 1998), larger teaching loads, and less access to informal sources of information about promotional criteria (Todd et al. 2008). Women are more likely to report tension between their work and family lives, speak less frequently with their colleagues, and rate their work environment more negatively on several dimensions (Fox 2010).

While informative, much of this research is based on those working in *academic* institutions located in advanced industrialized locations. In spite of the basic sociological premise that a person's position within a variety of social structures impacts his/her attitudes, perceptions, behavior, and life chances, little is known about gender disparities in other research contexts, making it difficult to fully understand scientific environments that might exacerbate, mitigate, or reproduce gender differences within careers. We address this gap by examining gender differences in assessments of the research environment for those working in both universities and national research institutes in Ghana, Kenya, and Kerala, India. Specifically, we ask the following questions: 1) Are there differences in men's and women's assessment of the research environment in terms of their satisfaction with funding, ratings of problems associated with communication and coordination, and sense of autonomy? 2) Do contextual factors—primarily sector of employment and/or region—account for these differences? 3) Does the effect of sex on perceptions of the work environment vary across sector and location? 4) And are there other factors—family status, education, and professional experience—that mediate the relationships between sex, context and perceptions of the work environment?

To answer these questions, we first engage with the debate regarding the degree to which organizations are gendered. While both universities and national research institutes are traditionally conceptualized as bureaucratic in structure, we argue deviations from the ideal bureaucratic form shape gender disparities in experiences and outcomes across the two sectors. Specifically, universities adopt an incongruous bureaucratic structure marked by a disjuncture between university and department level policies regarding expectations for hiring, promotion, and reward structures (Bird 2011). By comparison, national research institutes adopt a hybrid structure, occupying a place between the public and the private and marked by the pooling of resources, flatter hierarchies, and more permeable boundaries (Gulbrandsen 2011). Following that, we highlight the characteristic features of universities and national research institutes that might contribute to differential perceptions and assessments of the work environment for men and women. Next, we summarize the context, data, and measures used before turning to the results. We end with a discussion of the implications of our findings for understanding gender differences in science.

THEORETICAL BACKGROUND

Traditional explanations for the different experiences of men and women in science tend to focus on a few explanatory factors including experience, education (Correll and Benard 2006; Long and Fox 1995), and family demands (Long and Fox 1995; Xie and Shauman 2003). Because time in one's position and education correlate with organizational rank and professional prestige, access to institutional resources, establishment of reputation, and professional maturity, those who have been in an organization longer and who possess certain kinds of human capital are more similar to one another (Cech and Blair-Loy 2010; Correll and Benard 2006; Hermanowitz 2009). As a reflection of that fact, women, who have historically been overrepresented among younger cohorts of scientists and underrepresented among PhD holders may have similar assessments of the research environment. Additionally, both the family and the scientific career require considerable commitments of time and energy. Some evidence suggests women with children experience role conflict and strain, in part due to being negatively stereotyped as less committed to their educations and/or careers (Coser 1974; Fox 2010; Long and Fox 1995).

While these factors are important for understanding gender differences in science, they locate the cause of disparities in the qualities of the individual scientist neglecting to fully examine the structural context in which scientific work takes place. Gendered individuals do not work in gender-neutral environments. Instead, a variety of empirical studies have demonstrated that the organizations in which men and women work are themselves gendered in that the organizational rules and policies tend to reproduce and maintain gender inequality in the work context (Acker 1990; Reskin and McBrier 2000; Smith-Doerr 2004; Whittington and Smith-Doerr 2008). Questions related to the *degree* to which organizations are gendered, whether or not they are oppressively gendered and the consequences of that have produced less consensus (Britton 2000; Reskin and McBrier 2000; Whittington and Smith-Doerr 2008).

Due to the ubiquity of bureaucratic structural forms (characterized by hierarchical, centralized, and formalized organization) in modern work environments, these questions often center on whether or not bureaucracy might act as a force against particularism and for universalism (Acker 1990; Baron et al. 2007; Britton 2000; Cook and Waters 1998; Reskin and McBrier 2000). Some argue the application of impersonal policies and procedures for organizational action, typically associated with bureaucracy, might act to mitigate gender inequalities in the workplace by minimizing the use of more particularistic factors such as gender in the evaluation of work (Baron et al. 2007; Cook and Waters 1998; Reskin and McBrier 2000).

Others argue bureaucratic work environments are inherently gendered, inevitably leading to disparities between men and women (Acker 1990; Britton 2000). From this view, the hierarchical nature of bureaucracy, the division of labor, and job evaluation criteria often reflect underlying assumptions about the ideal worker, his/her career goals and expected productivity, life demands, and skills (Acker 1990; Britton 2000; Whittington and Smith-Doerr 2008). In fields related to science, technology, engineering, and mathematics (STEM), this ideal worker tends to put in long hours, is highly visible in his/her respective field, and maintains a solid boundary between work and home life, characteristics that are traditionally associated with a stereotypical male worker (Benschop and Brouns 2003).

While empirical evidence exists to support each of these positions, both views are problematic as the potential role of other factors in shaping gender disparities is minimized.[1] Because bureaucracy represents an ideal type, most work settings adhere more or less to the ideal typical bureaucratic form in the actual implementation and practice of institutional policies. Indeed, most organizations combine bureaucratic characteristics with what has been labeled post bureaucratic characteristics (Bolin and Harenstam 2008). Universities and national research institutes both deviate from the ideal bureaucracy in a variety of ways, which may have consequences for the saliency of gender in these contexts. What, then, are the characteristics typical of universities and national research institutes and how might those qualities shape men and women's assessments of their work environment?

THE CASE OF UNIVERSITIES AND NATIONAL RESEARCH INSTITUTES

Three general characteristics distinguish national research institutes from universities and, we argue, are particularly instructive for shaping gendered assessments of the research environment: flexibility, collaboration, and authority structures. Variously referred to as public institutions, research departments or government laboratories, national research institutes are heavily involved in applied research and development activities but are generally not actively involved in higher education, outside of training

[1] Field and university (research vs. teaching) differences within academia have been a prominent feature used to explain the career trajectory of academics. Hermanowicz (2009), in his longitudinal study of academic scientists, found that the type of academic institution within which people are employed (teaching, research, or those with equal weight placed on teaching and research) shaped career experiences and satisfaction.

graduate students (Gulbrandsen 2011). Argued to occupy a hybrid position between for-profit industry, policymaking, and academia, national research institutes combine features characteristic of the public and the private and the science and non-science spheres and they tend to have close partnerships with organizations in these sectors (Gulbrandsen 2011).[2] Consequently, while national research institutes often have promotional criteria and career ladders modeled after academia, they are also often marked by more collective decision making structures, tend to be highly collaborative both inter and intraorganizationally, and due in part to the more applied nature of research activities in these organizations, national research institutes require the pooling of expertise resulting in a more flexible division of labor intraorganizationally (Bolin and Harenstam 2008; Gulbrandsen 2011).

As opposed to the more hybrid model of work adopted by national research institutes, universities are marked by incongruous bureaucratic structures (Bird 2011). While the university might have formalized personnel practices that reduce the use of ascriptive characteristics in the evaluation of faculty work, departments and key personnel have a high degree of autonomy in how they implement these policies and they often develop their own set of governance practices (Bird 2011). Additionally, while university faculty may collaborate formally and informally with others, they are often rewarded and recognized as individuals (Fox and Colatrella 2006; Gulbrandsen 2011; Smith-Doerr 2004).

Due, in part to the disjuncture between university and department level decision-making and performance evaluation processes, rules and promotional criteria may be less clear in the academic sector than in the more hybrid structure of national research institutes. For example, while teaching may be touted as a core mission of the university,

[2] Indeed, research institutes' mandates often specify the goal of acting as a link between sectors.

something women tend to spend a larger chunk of their time doing, faculty often report that the informal expectation is that research will be recognized and rewarded more readily (Bird 2011). In combination with the incongruous features of universities, the more individual oriented award structure may also penalize women whose professional networks are more restricted than men's (Miller and Shrum 2012; Whittington and Smith-Doerr 2008). In comparison, the more flexible, collaborative, and collective decision making structure characteristic of national research institutes might create an environment that enhances women's ability to engage in research in that rules and policies are more clearly communicated and applied and project based work tasks and teamwork draw less attention to "gender differences than to individual contributions to the group" (Smith-Doerr 2004: 31; Whittington and Smith-Doerr 2008).

CONTEXT OF THE STUDY

Findings are based on primary survey data gathered in 2010 as part of a longitudinal study on scientific communication and the process of knowledge production in Ghana, Kenya, and Kerala, India. The first wave of data were gathered in 1994, followed by three subsequent waves in 2001, 2005, and 2010.[3] Initially part of a Dutch funded project studying the needs of the research system in areas varying by social and economic progress, Ghana, Kenya, and Kerala were selected to represent low, medium, and high levels of development respectively. While the ranking of the three locations has shifted over time on some indicators, the general hierarchy remains the same, particularly on

[3] For the 2001 wave, significant resource constraints required that we collect data in successive years beginning in 2000 in India, continuing in 2001 with Kenya, and in 2002 in Ghana.

measures related to scientific and research based activities and capacity (in terms of staff, expenditures, and the number of agencies) and the status of women in each location.

In comparison to many other African nations, research in Kenya is well funded, well-staffed and the country is among the continent's leaders on a variety of measures related to scientific and research activities. Based on data from the *Web of Science*, Kenya ranks 7th in Africa, out of more than 50 countries, in terms of total publication output and is rated 3rd in Africa in terms of collaborations with the United States (Adams et al. 2013). Ghana, on the other hand, ranks 7th in Africa in terms of collaborations with the United States and 12th in terms of total output (Adams et al. 2013). Although both Kenya and Ghana perform relatively well on many of these indicators, the two countries also face an aging pool of workers in their research sectors due to hiring freezes and new restrictions placed on directly recruiting new graduates from universities (Flaherty et al. 2010; IFPRI 2011).

The position of women in both African countries has improved substantially in recent years, although Kenya has made greater progress than Ghana on many measures. An approximately equal percentage of girls are enrolled in secondary education programs as boys in both countries (45.9% of those enrolled in Ghana are girls, compared to 47.6% in Kenya), but by the time students enter tertiary education programs, the representation of women drops to 34.2% and 41.2% of all students enrolled in Ghana and Kenya respectively (World Bank 2013). In 2008, 11% and 20% of all PhD and MSc qualified staff in the agricultural research and higher education agencies in Ghana were female (Beintema and Di Marcantonio 2008; Flaherty et al. 2010). In Kenya, the corresponding figures were 21% and 29% in the same year (Beintema and Di Marcantonio 2008). Kenya is, in fact, among the top three African countries in terms of the number of women working in agricultural research and higher education.[4]

India's scientific and educational system is one of the largest, best coordinated, and productive in South Asia (Stads and Rahija 2012). As a reflection of its considerable size and government investments in research, India produced 19,917 scientific and technical journal articles in 2010 (World Bank 2013) and boasted approximately 136 (per million people) researchers working in R&D in 2005, placing it among the top ten countries globally in terms of the number of researchers (World Bank 2013). In recent years India's research capacity has weakened at agricultural universities due in part to the fact that there tends not to be dedicated R&D budgets at these institutions (Stads and Rahija 2012). Indeed, much of the research coming out of India is not done in universities (Krishna 2014). Like Ghana and Kenya, over the past decade India has experienced national recruitment freezes at the same time that many of the country's current research staff are reaching mandatory retirement age resulting in an overall reduction in the number of researchers.

Within India, Kerala was selected due to the size and complexity of the research system at the national level. The state was not intended to be representative of the rest of the country, and is, in fact, famous in the development literature for its unique pattern of economic and social growth. Historically, the state is known for its relatively low levels of economic growth but strong social indicators in terms of such measures as literacy, life expectancy, birth rates, and gender equality. In comparison to the rest of India, Kerala rates highly on the gender development index (Kerala Human Development Report 2005).

[4] As a point of reference, the number of female researchers with PhDs at one of Kenya's leading institutions tripled from 16 to 49 full-time equivalent staff (Flaherty et al. 2010).

METHOD

The survey instrument and methods for the 2010 wave of the study were based on those used in the original 1994 wave, with two differences. First, the 2010 survey instrument included more questions related to information and communication technologies. Second, the objective of the 1994 survey was to achieve relatively comprehensive coverage of a broad range of researchers and organizational entities. This entailed selecting scientists from a relatively large sample of research institutes, universities, NGOs, and international research centers. However, owing to the effort, time and expense involved, the sample was relatively small and only a few (generally two to four) scientists could be interviewed at each organization. The objective of the subsequent surveys, including the 2010 wave, was to achieve better coverage of fewer organizations, in order to maximize the sample that could be generated with available resources.

In selecting institutions for inclusion in the study, we focused on universities and national research institutions in or near the capital cities (Trivandrum in Kerala, Accra in Ghana, and Nairobi in Kenya) due to the clustering of research activities near the capitals. Five institutions were selected for inclusion in Kerala including two universities—the Kerala Agricultural University at Vellayani and the University of Kerala at Karryavotam—and three national research institutes—the Center for Earth Science Studies (CESS), the Central Tuber Crops Research Institute (CTCRI), and the Regional Research Laboratory (now the National Institute for Interdisciplinary Science and Technology).

Respondents from Ghana were selected from two universities—the University of Ghana and the University of Cape Coast—and a variety of national research institutions—the Science and Technology Policy Research Institute, the Institute for Science and Technical Information, and a number of subsidiary organizations under the Council for

Scientific and Industrial Research (CSIR)—the largest and oldest government research institute in Ghana. Four institutions were selected for inclusion in Kenya including two universities—Egerton University and the University of Nairobi—and two of Kenya's five largest research institutes—Jomo Kenyatta University of Agriculture and Technology and the Kenya Agricultural Research Institute (KARI).

In determining eligibility for inclusion in our study, we adopted a demand-based approach, restricting respondents to those working in a university or national research institute in a scientific field regardless of rank or level. We approached the director of each selected department and research institute for a list of scientists and sought to interview everyone with a job title of scientist regardless of degree held. All staff in the selected institutions meeting this criterion was asked to participate in a face-to-face interview lasting approximately 45 minutes to an hour, such that our data represent a population, albeit of a subset of the research organizations in each of the three regions, rather than a sample. The majority of those selected were employed in agricultural, environmental, or natural resource management fields, with a few in the social sciences. In 2010, a total of 236 women and 685 men were interviewed. Of these, 110 women and 153 men were from Kerala, 74 women and 268 men were from Kenya, and 52 women and 264 men were from Ghana.[5] Owing to the endorsement of management, refusals were very few (we estimate fewer than 5%).[6]

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[5] Nearly 90% (826) of the 921 individuals included in this sample had full data on all of the variables included.

[6] It has always been difficult to calculate a conventional response rate for our population: often the list of staff includes individuals who are no longer present or on extended study leave. The primary issue for interviewers is only the availability of staff during the period allocated for the interviews at the location. The actual number of verbal refusals to be interviewed was trivial during the entire period of the study.

The survey itself includes a number of sections related to different aspects of the respondents' careers including: personal and educational background, professional and research activities, collaboration, professional and organizational networks, productivity, and access to and use of a variety of information and communication technologies. The analysis presented here is derived from an attitudinal section of the survey asking respondents to agree or disagree with a variety of statements as discussed at more length in the next section.

Dependent Variables

A factor analysis identified three distinct dimensions related to men and women's assessment of and experiences with the social and organizational environment in universities and national research institutes.[7] Three scales were constructed to reflect these dimensions: satisfaction with funding, problems associated with communication and coordination, and sense of autonomy:

1. Satisfaction with funding: Three items tap the first measure including opportunities for research funding, sufficiency of research funding, and characterization of research funding.
2. Problems associated with communication and coordination: four items are used to assess the second measure, including problems coordinating schedules, problems contacting people when they are needed, problems with the length of time to get things done, and problems with transmitting information.
3. Sense of autonomy: Three items tap the final measure including the freedom to select one's own research problems, the freedom to publish without asking

[7] Table 1 reports the rotated factor loadings for the variables included.

permission, and the extent to which it is just as easy for men and women to get ahead in their research careers.

Table 1. Rotated Factor Loadings of Three Dimensions Measuring Satisfaction with Research Climate			
	Satisfaction with Funding & Resources	Problems with Communication & Coordination	Autonomy
1. My research funding is sufficient 2. Funding opportunities for research are readily available 3. Characterization of funding opportunities at present 4. Problem with coordinating schedule 5. Problem with contacting people 6. Problem with length of time to get things done 7. Problem with transmitting information 8. I have a lot of freedom to select my own research 9. I am free to publish without permission 10. It is just as easy for women to get ahead in research as men	.845 .825 .807	.785 .744 .669 .644	.755 .718 .684

In order to make the values comparable, the total score for each scale was divided by the number of items comprising the scale. All items included in the first and third scales are measured on a four-point Likert scale (coded from 1 to 4). Values closer to four indicate stronger agreement with the statements included in each scale, whereas values closer to 1 indicate stronger disagreement.[8] All items included in the second scale are measured on a three-point Likert scale (coded from 1 to 3), with values closer to 3 indicating an issue is a major problem and values closer to 1 indicating an issue is not a

[8] A principle component analysis (PCA) was conducted. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .710 (indicating the sample size is good for factor analysis) and all KMO values for individual items were > .5, which is above the acceptable limit of .5 (Field 2009). Bartlett's test of sphericity chi square (45) = 1517.429, p < .001, indicated that correlations between items were sufficiently large for PCA. Three components had eigenvalues over Kaiser's criterion of 1 and in combination explained 57.67% of the variance.

problem at all. According to the univariate statistics reported in Table 2, women report slightly more satisfaction with funding, are more likely to perceive problems with communication and coordination, and they are less likely to feel a sense of autonomy in their careers (lines 8-10).

Table 2. Univariate Statistics for all Variables by Sex

	Female	Male	N
1. # young children[1]	1.11	1.53	895
2. %Married	85.9	90.9	905
3. %Spouse a researcher	28.0	9.8	851
4. %PhD	64.4	55.6	919
5. #Yrs of experience	17.99	17.55	920
6. %University	56.8	50.5	921
7. %Country			
Ghana	22.0	38.5	316
Kenya	31.4	39.1	342
Kerala	46.6	22.3	263
8. #Satisfaction with funding	2.05	1.97	921
9. #Problems with communication & coordination	1.71	1.63	882
10. #Sense of autonomy	2.98	3.15	914

[1] Variable names proceeded by a # are interval ratio and reflect the mean value. Those proceeded by a % are nominal and reflect the percentage of respondents who are 1) married, 2) married to a researcher, 3) possess a PhD, 4) who work in a university, 5) who live in Ghana, Kenya, or Kerala.

Independent Variables

The primary independent variables are sex (1=female; 0=male) and sector (1=university; 0=national research institute)[9], and the interaction of employment sector with sex (1=women working in universities; 0=all other groups). Women are slightly more likely to be employed in universities than in national research institutes, whereas men are

[9] Although examining each organization separately would strengthen the analysis, we argue that organizations within the two sectors follow a certain logic and underlying rational so that sectoral characteristics can provide a general sense of a common organizational mode of thinking and acting. Indeed, due in part to global pressures, many institutions worldwide adopt similar science policy, rules of evaluation, and merit, organizational hierarchies and boundaries between disciplines in order to claim scientific legitimacy (Drori et al. 2003).

evenly represented in both sectors (line 6 of table 2). We also explore regional context using two dummy variables, Ghana and Kenya, with Kerala as the reference location or the excluded group. In addition, we examine the interaction between sex and region: Kenya with sex (1=women in Kenya; 0=all other groups), and Ghana with sex (1=women in Ghana; 0=all other groups). Women from Kerala make up a much larger percentage of our respondents than women from Ghana or Kenya (line 7).

Mediating Variables

Several variables are included to account for factors identified in previous work as important predictors of gender differences in science: educational attainment, family status, and work experience in the respondent's organization at the time of the interview. Educational attainment is assessed with a dummy variable measuring the respondent's highest degree, 1=PhD and 0=other degree. Women are slightly more likely than men to possess a PhD (line 4 of table 2). Family status is measured using three variables: 1) a count variable for the number of children younger than 21; 2) marital status (1=married; 0=other); and a dummy variable for spouse's occupation (1=spouse is a researcher; 0=other). Consistent with research on female researchers in the United States, women in these three locations have fewer children (line 1 of Table 2), are slightly less likely to be married (line 2), and when married, are much more likely to be married to another researcher compared to male researchers (line 3). Women and men possess, on average, an equal number of years of work experience, measured in years (line 5).

RESULTS

Tables 3-5 present the ordinary least squares estimates of a series of three nested models for each of the three dimensions of satisfaction with the research environment. In Model 1, only the mediating variables are included. Model 2 adds the direct effect of sex, sector of employment and home region. In Model 3 the interaction between sex and sector of employment and sex and home region is included. This procedure allows us to comment on the main effects of gender and context (sector and home region).

TABLE 3: Ordinary Least Squares Regression of Satisfaction with Funding on Mediating Variables, Sex, Sector, and Interaction Terms

Variable	Model 1	Model 2	Model 3
Family Characteristics			
# of young children	-.085***	-.003	-.006
Married	.129	-.074	-.039
Spouse a researcher	.132	.097	.086
PhD	.285***	.229***	.222***
# Years of Experience in organization	.007*	.002	.002
Female		-.150**	-.341**
University		-.417***	-.376***
Kenya		-.829***	-1.617***
Ghana		-.705***	-1.697***
Female x University			-.020
Female x Kenya			.340**
Female x Ghana			.379**
Constant	1.711***	3.456***	3.825***
N	826	826	826
R2	.093	.379	.389

***p<.001; **p<.01; *p<.05

Table 3 presents the results for the dependent variable measuring satisfaction with the research environment in terms of funding. Beginning with the mediating variables in Model 1, Table 3 demonstrates that those with a PhD and reporting more years of experience are also more satisfied with their funding situation than are those who are more inexperienced and do not have a PhD. Those with young children are less satisfied.

Once we account for other factors, however, the effect of the mediating variables disappears, except for the relationship between education and satisfaction, which continues to be positively and significantly related to this dimension of the research career.

More important for our questions of interest are Models 2 and 3. Women, those working in universities, and those working in Ghana and Kenya are significantly less satisfied with their funding situation than are men, those working in a national research institute, and those working in Kerala. This pattern holds for the independent variables in both the noninteractive model and Model 3. Model 3 in Table 3 demonstrates that, in addition to the patterns noted above, female scientists in Kenya and Ghana are more satisfied with their funding situation than male scientists, while the lack of significance for the interaction between gender and university indicates that men and women within the university setting are similarly satisfied with the research environment as it relates to funding. In other words, regional context appears to matter more for female researchers than sector.

Turning to Table 4, we examine the predictors of men and women's assessment of problems within the research system. Model 1 indicates that none of the mediating variables are significantly related to researchers' assessment of problems related to communication and coordination. As with Table 3, Models 2 and 3 are most important for answering our research questions. According to Model 2, women, those working in the university setting, and those from Kenya are all more likely to indicate that there are major problems with communication and coordination. Turning to Model 3 it is evident that working in a university is associated with a greater sense of problems, and this effect is particularly salient for women. Women working in universities are significantly more likely to report problems than are men or researchers' working in national research institutes.

TABLE 4: Ordinary Least Squares Regression of Problems Related to Communication and Coordination on Mediating Variables, Sex, Sector, and Interaction Terms			
Variable	Model 1	Model 2	Model 3
Family Characteristics			
# of young children	.007	-.004	-.002
Married	-.133	-.058	-.070
Spouse a researcher	-.002	-.035	-.029
PhD	-.012	-.035	-.029
# Years of Experience in organization	-.001	.000	.000
Female		.102**	-.016
University		.141***	.084*
Kenya		.207***	.080
Ghana		.086	.267
Female x University			.215**
Female x Kenya			.069
Female x Ghana			-.074
Constant	1.789***	1.187***	1.497***
N	794	794	794
R2	.006	.065	.077
***p<.001; **p<.01; *p<.05			

Finally, Table 5 examines the factors related to a sense of autonomy and ability to advance within the research career. The first Model in Table 5 again demonstrates the effect of the mediating variables on this dimension. As with the first dimension analyzed in Table 3, possession of a PhD is significantly related to one's sense of autonomy in the career. Specifically, those with the PhD are more likely to report a sense of autonomy than are those without a PhD, a finding that emerges across all three models. Prior to controlling for the interaction effects in Model 2, sex emerges as a significant and negative predictor of one's sense of autonomy, while sector and home region are positively related to one's sense of autonomy. In other words, women are less likely to report a sense of autonomy than are men, while those working in universities and living in Kenya and Ghana are more likely to report such autonomy. Turning to Model 3, the independent effect of sex and home region disappears, while those working in universities continue to report a greater degree of autonomy. However, the effect of sector on one's sense of autonomy is different for men and women. Women in universities are less likely to report a sense of autonomy than are other researchers in our sample suggesting, as with the dimension analyzed in Table 4, that women's experiences with the research environment are mediated more by sector than region.

TABLE 5: Ordinary Least Squares Regression of Sense of Research Autonomy on Mediating Variables, Sex, Sector, and Interaction Terms

Variable	Model 1	Model 2	Model 3
Family Characteristics			
# of young children	.034	-.001	-.005
Married	.088	.107	.149
Spouse a researcher	.032	.097	.093
PhD	.198***	.174**	.166**
# Years of Experience in organization	-.005*	-.003	-.003
Female		-.171**	-.100
University		.248***	.326***
Kenya		.247***	-.109
Ghana		.232**	.047
Female x University			-.262*
Female x Kenya			.142
Female x Ghana			.066
Constant	2.928***	2.775***	2.527***
N	820	820	820
R^2	.026	.092	.101
***p<.001; **p<.01; *p<.05			

SUMMARY AND CONCLUSION

We examined perceptions of the research environment for men and women working in universities and national research institutes in three locations: Ghana, Kenya, and Kerala India. Specifically, we addressed the following questions: 1) Are there differences in men and women's assessment of the research environment? 2) Do contextual factors—primarily sector of employment but also controlling for home region—account for these differences? 3) Does the effect of sex on perceptions of the work environment vary across sector and location? 4) Are there other factors that mediate the relationship between sex, context and perceptions of the work environment? Three findings emerge related to these questions.

First, possession of a PhD emerged as a fairly consistent indicator for the first (satisfaction with research funding) and third (sense of autonomy) dimensions measured with those possessing a PhD reporting more satisfaction. Future research should explore further the role of education in shaping men and women's experiences in this context, particularly in light of the fact that overtime women in these three locations have increased their representation among PhD holders (Miller et al. 2006). While sex continues to be a fairly consistent predictor of experiences with the scientific career, the interaction between sex and education and education and sector, might offer further explanations for this phenomenon.

Second, in comparison to their male counterparts, female scientists' satisfaction with the research environment as it relates to funding is governed more by national context than institutional context. Female scientists in both African nations are more satisfied with the environment for research than their male counterparts in Kenya and Ghana and their male and female counterparts in India. The status of female scientists in Africa has gained considerable attention from international agencies over the last several years, and the numerical presence of women in scientific careers in both Ghana and Kenya has improved—although still lagging considerably in comparison to men (Beintema and Di Marcantonio 2008). As just one example, the African Women in Agricultural Research and Development (AWARD) program offers fellowships to African women scientists who undergo two years of career development training with a focus on mentoring partnerships, developing science skills, and cultivating leadership capacity (AWARD 2014). While not providing research grants, this program is a prime example of the focus the international community has directed towards encouraging the participation and success of African women in science. Although our data cannot directly speak to this, it may be that the attention paid to the role of women in African science by international organizations has indeed improved the funding situation for the small number of women scientists working in places like Ghana and Kenya.

Finally, and most importantly for our argument, female scientists sense of satisfaction with the research environment as it relates to problems with communication and coordination and their sense of autonomy is more closely governed by sectoral context than by national context. Female scientists at universities report experiencing major problems when it comes to communicating and coordinating with others, and they report less autonomy in their work than their male counterparts. Cross-national differences are not gender specific. The greater difficulty women in academia experience on these measures provide preliminary support for the argument regarding the impact of incongruous bureaucratic structures vs. hybrid structures on women's experiences. Specifically, the more collaborative, flexible, and collective nature of work characteristic of hybrid structures like national research institutions, contribute to a greater sense of satisfaction with the research environment, while the decentralized and individual reward structure characteristic of incongruous bureaucratic settings like the university appears to negatively impact women's experiences with and perceptions of the research climate.

It is important to highlight that our argument is not that women are better suited for more collaborative environments due to an inherent nature. Instead, because the hybrid structure of research institutes necessitates interorganizational collaborations and the pooling of expertise in order to function in the hybrid space, work rules, accountability, and promotional requirements may be clearer, particularly in comparison to the more incongruous structure of universities. Successfully navigating the political environment of academia requires understanding both the formal university expectations and the informal practices often adopted by different departments and even individual chairs. While both men and women may benefit from more transparency, it is well documented that women's professional ties tend to be smaller and contain a larger proportion of other women in comparison to their male counterparts (Miller and Shrum 2012). This characteristic of their professional ties may, in turn, limit their access to information regarding the informal practices that are often more important for retention and promotion than are the formal rules.

By examining the subjective experiences of men and women in these two work contexts our analysis taps into an important dimension of gender inequality within science, but future research should examine the link between these experiences and other career outcomes. Does the disparity in satisfaction translate into disparities related to publication productivity, professional networking, or institutional rank? The degree to which men and women perceive their work climate to be one that is supportive of research activities will also shape an individual researcher's sense of inclusion in informal and formal professional networks and the likelihood of turning to colleagues for advice or support, the sharing of information, and the evaluation of ideas. This, in turn, might constrain or enable access to information regarding promotion and grant funding and depress or boost publication productivity, which reinforces one's sense of satisfaction with the research climate and the likelihood of being promoted and retained in the scientific career, particularly for those women working in academia. Although it is unlikely that the structure of large, modern universities will change in significant respects, one step they might take to improve women's experiences is to explicitly provide mentoring opportunities, particularly for junior faculty.

In conclusion, our results elaborate on the operation of gender within different work contexts and provide insight into the features of organizations that might contribute to differential career paths for men and women. While this study does not end the question related to the role of bureaucracy in creating, mitigating, or reproducing gender disparities, it does provide preliminary confirmation that rather than view bureaucracy as a monolithic structural form, researchers should turn their attention to the degree to which organizations mimic or deviate from the ideal type and explore further what that means for other outcomes of the research career.

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