

Reducing Inequality in Higher Education: The Link between Faculty Empowerment and Climate and Retention

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Abstract Since 2001 the National Science Foundation’s ADVANCE program has distributed over \$130 million in grants to improve work climate, enhance professional success, and increase recruitment and retention of female faculty in STEM fields. The process by which each institution designs and implements these interventions is seldom studied, however. Using climate surveys, administrative records, and a difference-in-differences regression approach, we assessed whether exposure to the design and implementation process helps explain improvements in climate and retention during the early years of ADVANCE implementation. We found that departments wherein at least one faculty member participated in ADVANCE committee work experienced significant improvements in job satisfaction among female faculty members and significant reduction in turnover among female full professors, suggesting that the ADVANCE design process was itself an intervention.

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A 2016 report by the American Council on Education indicated that gender inequality remains a problem in higher education (Johnson 2016). Although women have earned over 50% of doctorates since 2006, they continue to be underrepresented in tenured faculty positions and overrepresented in non-tenured, instructional faculty positions (Curtis 2011; Johnson 2016). Similarly, a 2007 report from the National Academy Press found that women had earned more than 30% of social science doctorates and more than 20% of life science doctorates for more than 30 years; but they still represented only 15% of full professors at top universities (Institute of Medicine 2007). Underrepresentation in the tenured faculty “is most evident in the Science, Technology, Engineering, and Mathematics (STEM) disciplines...where women comprise 25.7% of all tenured faculty in STEM at 4-year colleges and universities,” (Hart 2016, p.606).

The National Science Foundation’s (NSF) ADVANCE program was established to reduce the effects of bias in higher education by promoting gender diversity in academic science and engineering.¹ Since the ADVANCE program began in 2001, NSF has spent more than \$130 million to support ADVANCE projects at more than 100 institutions of higher education and not-for-profit organizations.² The centerpiece of the ADVANCE program is the Institutional Transformation (IT) program, which provides participating organizations with resources to promote large-scale, comprehensive change in institutional practices so as to achieve program goals.

Unnamed University (UnU), which is one of the largest universities in the United States, framed its ADVANCE IT program around the American Psychological Association’s (APA) psychologically healthy workplace model. According to the APA (2015), an organization can support psychologically healthy workplaces through activities that fall into five broad categories: employee involvement/empowerment, balancing personal and professional life, training and development, health and safety, and rewards and recognition. Previous research suggests that people who work in psychologically healthy workplaces have lower turnover, less stress, and higher satisfaction than the national average (Grawitch et al. 2007). In an analysis of faculty and staff at a Midwestern university, Grawitch et al. (2007) found that satisfaction with psychologically healthy workplace practices—particularly satisfaction with involvement practices—was positively related to higher levels of organizational commitment and mental well-being and lower levels of emotional exhaustion and turnover intentions.

One key feature of the UnU ADVANCE program, which differs from ADVANCE programs at other institutions, was the decision to involve the university community broadly in the design and implementation of each of the proposed activities. Design and implementation committee members, who typically were not involved in drafting the ADVANCE proposal, were engaged in each of the project activities from the beginning, with the idea that each committee would gradually assume total responsibility for its activities. For example, the ADVANCE Committee on Department Head Workshops developed the content for the workshops and decided how that content should be delivered. The stated goal of such widespread participation in the UnU ADVANCE program was to enhance the probability that successful activities would be institutionalized after the end of the grant.

We hypothesized that the inclusive way in which ADVANCE was implemented at UnU created an alternative channel through which the various activities could have affected STEM

¹ http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383

² <http://nsf.gov/crssprgm/advance/index.jsp>

faculty members. Namely, that involving them in the committees charged with designing the ADVANCE interventions was an intervention in and of itself—an intervention specifically targeting employee involvement. Therefore, using climate surveys, administrative records, and a difference-in-differences regression approach, we assessed the degree to which exposure to the ADVANCE design process—as measured by the presence of a committee member in one’s home department—helped explain improvements in faculty satisfaction and retention during the early years of ADVANCE implementation.

Notably, our analysis focused on exposure, not participation. We did this for two reasons. First, we believed that there could have been important spillover effects to department members as committee members discussed ADVANCE work with their colleagues. While a department member may not have personally participated in the committee work, a colleague who did participate could have modeled new behaviors and/or shared new information, which in turn reduced either fear of the behavior or the inertia to perform it. Wheeler (1966) referred to this mechanism as “behavioral contagion” (p. 179). Second, we could not directly link committee members to the climate and administrative data for confidentiality reasons, so an analysis of direct committee participation was not possible.

The Literature on Employee Involvement

The NSF ADVANCE grant program seeks to improve representation of women in academic science and engineering fields by changing an institution’s climate—how the institution recruits, hires, supports, and retains its faculty members. UnU sought to create a more inclusive work environment using the APA’s psychologically healthy workplace framework. According to the APA (American Psychological Association 2015), a psychologically healthy workplace “fosters employee health and well-being while enhancing organizational performance and productivity” (p. 1). On their organizational excellence website, the APA says that increasing employee involvement empowers workers by giving them a say in decisions and increasing their autonomy (American Psychological Association 2015).

These practices are a key element of a psychologically healthy workplace and cover a broad range of activities that encourage employee participation. Activities might range from a modest suggestion box or open-door policy to heavily involved employee-managed work groups and total quality management practices (Grawitch et al. 2009). Common features of employee empowerment/involvement practices include “sharing information, autonomy in making decisions and improving intellectual capacity” (Ongori 2009, p. 10). Phipps et al. (2013) developed a theory to explain the interaction between aspects of employee involvement, commitment, and organizational productivity. Their model implies that empowering employees through decision-making, offering chances to increase knowledge, sharing information, and rewarding productivity, when moderated by the employee’s commitment to the organization, serve to increase overall productivity (Phipps et al. 2013).

There are many ways to encourage employee involvement in workplace decision-making. One specific employee participation initiative uses high involvement work processes, whereby employees are actively involved in decision-making that affects the organization (Butts et al. 2009). Such a system gives employees “increased power to make decisions, access to critical information, exposure to rewards linking individual performance to organizational outcomes, and opportunities to expand organizational- and task-related knowledge” (Butts et al. 2009, p. 123). In their research on how high involvement practices improve productivity, Butts et al.

(2009) found that these incentives increased feelings of empowerment and productivity, especially when accompanied by the employee's perception that the organization supports these practices and employees.

One way to incorporate high involvement processes into faculty activities may be through committee involvement, which is already a part of the professional role of a faculty member. Rosser (2004) looked at the combination of a faculty member's work life satisfaction and overall job satisfaction against reported intent to leave and found that committee membership can have either a positive or negative effect on work life satisfaction (Rosser 2004). While service on committees improves probability of tenure, too much time devoted to committee work has a negative effect on work life satisfaction, especially for minority women (Rosser 2004). Smart (1990) investigated the relationship between committee membership and feelings of influence within an institution and found that faculty members who felt they could influence decisions in committees had lower turnover rates. These positive feelings may be particularly relevant for committee work that targets addressing inequities and for those committee members most likely to be affected by inequities. For example, Griffin et al. (2011) noted that minorities actively engage in academic service and find value in such service in order to "combat challenging climates" and "serve as a voice for communities of color on campus" (p. 515). Baez (2000) similarly found that academic race-related service for academics of color increases their sense of agency in "initiating social change" (p. 364).

Recent work by Welch and Jha (2016) confirmed these multi-faceted findings, showing that "perceived influence" on committees was significantly related to increased job satisfaction and that more time spent in service and committees in general was negatively correlated with job satisfaction. In a national survey of professors (who were overwhelmingly white males) Fjortoft (1993) found that one of the most positive influences on a sense of organizational commitment was a professor's view of their opinions affecting policies within the department or university; this finding led the author to suggest that institutional leaders may wish to "have mechanisms in place for participatory decision making, such as committees with real authority" (p.14). Thus, committee work appears more likely to have a positive rather than negative effect on job or life satisfaction if the participants feel that their contributions are influential, if the committee holds real decision-making power, and if it is addressing substantive issues and concerns such as inequities.

Outside of academia, researchers have found that employee and citizen participation in decision-making committees was correlated with higher satisfaction and a sense of personal effectiveness. In an examination of longitudinal work satisfaction data, Mohr and Zoghi (2008) found that involvement in task teams and quality circles increased job satisfaction although they also found that more satisfied employees may participate in high involvement programs with greater frequency, suggesting reverse causation. Similarly, in a survey of neighborhood volunteer organizations, Ohmer (2007) found that participating in decision-making and daily work activities improved participants' sense of personal effectiveness and group effectiveness. The structure and function of committees may affect their outcomes. For example, Cotton et al. (1988) found that long-term, formal committees had mixed effects on satisfaction and productivity ratings while short-term, informal decision-making groups had positive effects on satisfaction and productivity ratings.

The UnU ADVANCE program designed interventions to affect each of the five broad aspects of a psychologically healthy workplace (i.e. employee involvement/empowerment, balancing personal and professional life, training and development, health and safety, and rewards and recognition). Program interventions addressed each of the populations that

influence climate for faculty members—faculty, administrators, students, and staff. Table 1 summarizes the suite of interventions. As the table illustrates, each intervention of UnU’s ADVANCE proposal addressed at least one of the five psychologically healthy workplace practices. Half of the interventions incorporated three or more of the practices.

The Study

Purpose

We examined whether or not exposure to the ADVANCE design process—as measured by the presence of a design and implementation committee member in one’s home department—improved retention and/or job satisfaction among female faculty members. We used administrative payroll data on nearly 2800 individual faculty members to examine retention and climate survey data to examine satisfaction and turnover intentions. Institutional Review Board approval was obtained for all evaluations described in this article.

The Difference-in-Differences Modeling Framework

UnU ADVANCE activities were not the only factors influencing climate and retention during the analysis period (2001–2013). The University instituted a university-wide salary freeze from

Table 1 UnU ADVANCE Activities and the Psychologically Healthy Workplace Practices

ADVANCE Activity	Practice				
	Employee Growth & Development	Employee Health & Well-Being	Employee Involvement	Employee Recognition	Work- Life Balance
Department Head Workshops	♦	♦	♦	♦	♦
Staff Development Training		♦			♦
Student Diversity Workshops		♦			♦
Merit Pool Incentive Program				♦	
Departmental Mini-grants	♦		♦	♦	
ADVANCE Scholar Program	♦	♦			♦
Administrative Fellows Program	♦	♦	♦		
Success Circles (Group Mentoring)	♦	♦	♦	♦	♦
ADVANCE Speaker Series	♦	♦			
Workshops for Future Women Faculty	♦				
Award and Search Committee Training	♦	♦	♦	♦	♦
Faculty Recognition Program		♦		♦	

2009 to 2011. An early retirement program was implemented in 2011, and there was also a hiring freeze. Turnover among top administrators created uncertainty. The Vice President for Diversity and the Dean of Faculties continued to sponsor programs that were unrelated to ADVANCE but might have influenced faculty climate and retention. These alternative sources of change created an analytic challenge that made identification of the effects of UnU ADVANCE programs difficult.

To address this challenge, we used a difference-in-differences approach to identify the relationship between committee exposure and faculty climate and retention. Because of the changes discussed in the previous paragraph, we cannot simply compare turnover and climate before and after the ADVANCE committee work. That effect would be measured with time bias (i.e. bias caused by changes over time). Another possibility would be to compare turnover and climate outcomes after the intervention for the departments that participated in ADVANCE design committees to those that did not participate in ADVANCE design committees. However, such a measure would include error because departments where faculty members chose to participate in ADVANCE committees could be different from departments wherein no one chose to participate. Fortunately, the type of error given by these two approaches comes from different sources. The difference-in-differences approach is able to subtract out the error caused by time bias with the first approach by comparing treated departments both before and after the treatment to non-treated departments both before and after the treatment.

Essentially, one measures differences between two groups (ADVANCE and non-ADVANCE) before the intervention (pre) and again after the intervention (post) to see if those differences have narrowed or widened. Measuring the difference in each group in the two time periods (pre and post) and then comparing the change between the two groups (ADVANCE and non-ADVANCE) adjusts for any unmeasured differences or common trends between the two groups (Gruber 2005). A difference-in-differences model uses changes in the difference between two groups (ADVANCE departments and non-ADVANCE departments) in order to isolate the impact of a policy affecting only one group (ADVANCE) from the impact of an environmental change affecting both groups (other changes happening over time at the university). Adding a third difference (i.e. a third dimension of comparison) yields a difference-in-difference-in-difference, or DDD model and provides additional controls for possible sources of bias. We followed a DDD approach that compared departments directly affected by ADVANCE to those that were not as the first difference, using before and after the change as the second difference, and women (who were treated) compared to men (who were not) as the third difference.

Consider, for example, our analysis of the probability of faculty turnover. Using probit regression we estimated the following reduced form equation:

$$\text{Pr}[\text{quit}] = \beta_0 X + T_i + \beta_1 * \text{female} + \beta_2 * \text{Treated} + \beta_3 * \text{female} * \text{Treated} + \beta_4 \text{POST} * \text{female} + \beta_5 * \text{POST} * \text{Treated} + \beta_6 * \text{POST} * \text{Treated} * \text{female} + \varepsilon_i$$

Where $\text{Pr}[\text{quit}]$ is an indicator variable that takes on a value of one if the person quits, X is a vector of faculty characteristics (race/ethnicity, national origin, years since the highest degree was granted, faculty rank, rank at hire, age group, administrator status, and indicators for division within the University), T_i is a school year fixed effect, and female is an indicator that takes on a value of one if the faculty member is female, Treated is the ADVANCE Committee

Exposure indicator, and POST is an indicator that takes on the value of one if the observation occurs after the ADVANCE grant was awarded to UnU in fall 2010.

This DDD specification allows departments that would subsequently participate in ADVANCE design committees to have systematically different retention rates for men and women in the pre-award as well as the post-award period. Thus, the marginal effect of the intervention (committee exposure) is identified by the change in the difference between male and female retention rates for departments that were exposed to ADVANCE, holding constant the change in the difference between male and female retention rates for departments that were not exposed. As such, β_6 represents our coefficient of interest as it is the “treatment” effect after controlling for differences between departments (β_2), between time periods (T_1), and between genders (β_1), as well as their secondary interactions (β_3 , β_4 , and β_5). This methodology, though common in program evaluation, has not previously been used to analyze ADVANCE programs at other institutions or high involvement work processes.

Our analysis of faculty climate has the same right hand side specification as above, but the dependent variable is a continuous variable constructed as a scale from the responses to specific questions on the climate survey. The estimation technique for the climate analyses is ordinary least squares.

The Data and Analysis

The data came from two sources—climate surveys and administrative records. Using both sources allowed us to measure both faculty members’ stated preferences in the climate survey and their revealed preferences in the turnover rates taken from administrative records.

Faculty at UnU developed the climate surveys incorporating existing validated scales from Cammann et al. (1983) and Demerouti et al. (2003). The University administered the surveys to all faculty members at flagship campuses in 2009 and again in 2013 in both paper and electronic formats.³ The response rate in 2009 was 29% or 723 responses; the response rate in 2013 was 45% or 1222 responses. In both years, the respondents were generally representative by gender (Table 2), but Asian faculty members and non-tenure track faculty members were underrepresented among the survey respondents. Full professors were also underrepresented among respondents to the 2009 survey. Each climate survey response was anonymous, so we were unable to determine the extent to which the individuals who responded to the 2009 survey also responded to the 2013 survey.

We used items that were common to the 2009 and 2013 climate surveys to construct a series of scales measuring career satisfaction, job satisfaction, life satisfaction, turnover intentions, and burnout.⁴ All of the item responses were in the form of five-point Likert scales, and items were reverse coded as needed to make all items on the same scale in the same direction (i.e., all higher scores indicating more positive feeling/experience or all higher scores indicating more negative feeling/experience). We defined the scale score as the mean of the items in the scale, and each item was coded from 1 to 5. Thus, each climate scale could also range from 1 to 5.

The panel of personnel data used in this analysis covers academic years 2000–2001 through 2012–2013 and includes tenured and tenure-track faculty from all divisions that have been part of UnU’s main campus throughout the analysis period (with the exception of the schools of

³ The Dean of Faculties office developed and administered the 2009 survey. Faculty members affiliated with ADVANCE refined and administered the survey in 2013.

⁴ A copy of the individual questions is available upon request to the corresponding author.

Table 2 2013 Climate Survey Respondent Demographics

	Total Responses (% of 1,222)	Total Faculty (% of 2,689)	Response Rate within Group
Sex			
Male	789 (66%)	1830 (68%)	43%
Female	412 (34%)	859 (32%)	48%
Transgender	4 (<1%)	? (?%)	
Not provided	17 (1%)		
Race			
African American/Black	21 (2%)	78 (3%)	27%
Asian	55 (5%)	355 (13%)	15%
Native American/Alaskan Native	4 (<1%)	9 (<1%)	44%
Latino/a or Hispanic	50 (4%)	159 (6%)	31%
Middle Eastern/Arabic	1 (<1%)	? (?%)	
Multiracial*	23 (2%)	5 (<1%)	
White	707 (58%)	2063 (77%)	34%
Not provided	361 (30%)	20 (<1%)	
Job Title			
Tenured Professor	423 (35%)	840 (31%)	50%
Tenured Associate Professor	288 (24%)	560 (21%)	51%
Tenure-track Assistant Professor	188 (15%)	359 (13%)	52%
Non tenure track	282 (23%)	908 (34%)	31%
Other		22 (<1%)	
Not provided	41 (3%)		

Notes: *Respondents who marked two races were classified as multiracial; 177 respondents indicated that they are currently in an administrative role

government and law, where there were too few faculty members for reliable inference). All tenured or tenure-track faculty members with at least a half-time appointment in one of the covered Colleges—Agriculture and Life Sciences, Architecture, Business, Education, Engineering, Geosciences, Liberal Arts, Science, and Veterinary Medicine—were included. Table 3 illustrates the proportion of women in the analysis panel, by STEM department and College.

We combined the personnel data with indicators for the extent to which members of various departments had been involved in the design process to construct our ADVANCE Committee Exposure indicators. These indicators take on a value of one if someone from a faculty member's home department participated on a designated ADVANCE committee, and zero otherwise. There is an indicator for exposure to each of the ADVANCE committees, and each of the activities in Table 1 (with the exception of the Merit Pool Incentive Program) had a corresponding committee.

Table 4 summarizes the ADVANCE committee exposure in departments that were and were not the intended targets of ADVANCE interventions. The ADVANCE team targeted all of the departments in the Colleges of Agriculture and Life Sciences, Engineering, Geosciences and Science, as well as the STEM departments in the College of Liberal Arts (i.e. Anthropology, Economics, Political Science, Psychology and Sociology).⁵ We consider all other departments in the covered colleges to have been non-targeted. As the table illustrates, 78% of faculty members in targeted departments and 10% of faculty members in non-targeted departments were exposed to at least one ADVANCE committee.

⁵ Although the College of Agriculture and Life Sciences contains a number of departments that are not STEM and therefore not eligible for NSF ADVANCE funding, the College of Agriculture and Life Sciences provided supplemental funding so that all of its departments were targeted.

Table 3 2013 Key Demographics from the Personnel Data Panel (2000-2001 through 2012-2013) by College and STEM status

College	Number of Obs.	Female	White	Asian	Asst. Prof	Assoc. Prof	Full Prof
NonSTEM Departments							
Agriculture and Life Sciences	1205	18.2%	79.6%	10.7%	22.3%	26.3%	49.0%
Architecture	1108	23.8%	75.9%	14.3%	27.4%	32.7%	36.3%
Education	1470	40.3%	73.9%	6.3%	24.8%	32.0%	38.3%
Liberal Arts	2386	33.7%	80.8%	2.1%	23.2%	34.1%	38.2%
Business	1296	18.5%	76.4%	13.9%	22.3%	24.3%	45.8%
Veterinary Medicine	1565	28.8%	89.9%	6.3%	17.8%	30.8%	47.6%
STEM Departments							
Agriculture and Life Sciences	2421	17.3%	84.2%	8.0%	20.1%	22.7%	54.8%
Engineering	4352	11.1%	64.8%	26.5%	27.3%	25.2%	44.4%
Geosciences	1169	14.2%	86.8%	9.0%	21.1%	24.4%	49.7%
Liberal Arts	1912	29.7%	75.7%	10.7%	30.4%	25.0%	42.0%
Science	3048	11.7%	83.2%	12.1%	16.3%	19.8%	53.2%

Note: In addition to assistant, associate and full professors, the panel also includes distinguished professors and tenured faculty in administrative roles (e.g. Deans and Vice Presidents)

Turnover Results

Using probit regression analysis, we examined the extent to which retention patterns among faculty members have changed since 2010, the first year of the ADVANCE program at UnU. All analyses also controlled for the following factors: college, STEM department, sex, race/ethnicity, national origin, the number of years since the highest degree was granted, faculty rank, rank at hire, age group, administrator status, and the annual average rate of growth in faculty salaries at UnU. The analysis covered tenured and tenure-track faculty from all divisions at UnU with the exception of the schools of government and law, as noted in the previous section.

As a first step for the analysis, we examined the relationship between turnover and an indicator for whether or not a department was targeted. We interpreted this analysis as an examination of the intent-to-treat because not all individuals or departments chose to engage with the ADVANCE activities designed by the members of the ADVANCE committees. Table 5 presents selected marginal effects from a probit analysis of faculty turnover. As the table illustrates in column 1, when taken as a whole, there is no evidence that turnover has changed for women in treated departments since the start of the ADVANCE program. However, when we look at each rank separately, as in column 4, it becomes clear that the turnover rate for female full professors in treated departments was 3 percentage points lower than we would have otherwise expected given historical patterns.⁶

Table 6 presents the estimated impact of exposure to ADVANCE committees on female faculty turnover. As the table indicates, during the early years of the ADVANCE program, turnover was significantly lower than expected in departments that were exposed to the ADVANCE design and implementation process. For example, the first row indicates that departments where some faculty member participated in any ADVANCE committee work had nearly a 3 percentage point lower

⁶ Note that faculty rank is a year-specific variable in the data panel, so an individual could have been an assistant professor in 2004-2005 and an associate professor in 2005-2006. This person would have been in the assistant professor subsample in 2004-2005 and in the associate professor subsample in 2005-2006.

Table 4 Committee Exposure Rates for Tenured and Tenure-Track Faculty

Committee	Non-Targeted Departments	Targeted Departments
Any ADVANCE Committee	9%	78%
Advance Speaker Series	4%	32%
Departmental Mini Grants	0%	26%
Award and Search Committee Training	1%	23%
Advance Scholar Program	3%	21%
Workshops for Future Women Faculty	2%	13%
Success Circles (Group Mentoring)	4%	11%
Administrative Fellows Program	2%	10%
Staff Development Training	0%	10%
Faculty Recognition Program	3%	9%
Department Head Workshops	4%	7%
Student Diversity Workshops	0%	5%

Note: All STEM departments plus the nonSTEM departments in the College of Agriculture and Life Sciences were targeted by ADVANCE. All other departments were considered non-targeted. The merit pool incentive program committee did not meet

annual turnover rate among female full professors than would have otherwise been expected given historical patterns. Turnover rates did not decline among female full professors in departments that did not engage in the ADVANCE design and implementation process.

Table 6 also illustrates the relationship between turnover and the exposure indicators for specific committees. As the table illustrates, departments that were exposed to a variety of ADVANCE committees saw declines in turnover among female full professors. Only departments where someone engaged with the Department Head Training Committee experienced declines in turnover among female associate professors. Turnover rates among female associate professors were 3 percentage points lower than would have been expected in departments that were not exposed to this ADVANCE committee. On the other hand, departments that were exposed to the Administrative Fellows, the Speaker Series, the Department Head Training, the Workshops for Future Women

Table 5 Selected Marginal Effects from Probit Analysis of Faculty Turnover

	All Prof	Asst. Prof	Assoc. Prof	Full Prof
Male	-0.00562 (0.0057)	0.00519 (0.0116)	-0.000861 (0.0084)	0.00069 (0.0098)
Treated* Female	-0.00145 (0.0074)	-0.00327 (0.0166)	0.0137 (0.0157)	0.0103 (0.0166)
POST*Treated	0.0045 (0.0074)	0.0617* (0.0318)	-0.0122 (0.0093)	-0.000769 (0.0083)
POST*Male	-0.00133 (0.0095)	-0.0254 (0.0187)	-0.00327 (0.0134)	-0.00989 (0.0141)
POST*Treated*Female	-0.0136 (0.0100)	-0.0197 (0.0240)	-0.0049 (0.0183)	-0.0314*** (0.0045)
Observations	21932	4993	5774	10741

Note: all models also include indicators for age, race, national origin, rank at hire, years since degree, administrator status, fiscal year, and college/STEM affiliation. Here Treated is an indicator for a department targeted by the NSF ADVANCE program (i.e. a STEM or College of Agriculture department regardless of committee involvement). POST is an indicator for the period after 2010. Robust standard errors appear in parentheses

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

Table 6 Selected Marginal Effects from Probit Analysis of the Relationship Between Faculty Turnover and ADVANCE Committee Exposure

	All Ranks	Asst. Prof	Assoc. Prof	Full Prof
Any ADVANCE Committee	-0.0153 (0.0094)	-0.00866 (0.0242)	-0.0135 (0.0139)	-0.0295*** (0.0059)
Staff Development Training	-0.0152 (0.0177)	-0.0184 (0.0336)	0.0388 (0.0845)	-0.0341*** (0.0019)
ADVANCE Scholar Program	0.00102 (0.0182)	-0.0225 (0.0212)	0.00587 (0.0390)	0.0103 (0.0423)
Administrative Fellows	-0.0370*** (0.0045)	-0.0530*** (0.0032)	-0.00189 (0.0445)	-0.0341*** (0.0019)
ADVANCE Speaker Series	-0.0245*** (0.0086)	-0.0380*** (0.0129)	0.000161 (0.0270)	-0.0344*** (0.0020)
Departmental Mini Grants	0.0473 (0.0432)	0.147 (0.1200)	0.0356 (0.0759)	-0.0339*** (0.0020)
Faculty Recognition	0.0624 (0.0488)	0.0595 (0.0763)	-0.0155 (0.0249)	0.289 (0.2190)
Department Head Workshops	-0.0380*** (0.0035)	-0.0477*** (0.0104)	-0.0323*** (0.0025)	-0.0339*** (0.0019)
Workshops for Future Women Faculty	-0.0329*** (0.0077)	-0.0531*** (0.0032)	-0.0211 (0.0178)	-0.0341*** (0.0019)
Award and Search Committee Training	-0.00581 (0.0169)	-0.0293 (0.0189)	0.0441 (0.0596)	-0.0341*** (0.0019)
Student Diversity Workshops	-0.0298** (0.0141)	-0.0529*** (0.0032)	0.968*** (0.0022)	-0.0338*** (0.0019)
Success Circles	-0.0378*** (0.0037)	-0.0532*** (0.0032)	0.0287 (0.0822)	-0.0342*** (0.0019)
Observations	21932	5057	5774	10741

Note: Each cell represents the coefficient from the treatment effect (i.e. the coefficient on the interaction between indicators for female, the POST period, and the designated activity committee) from a separate regression. All specifications also include the necessary main effects for DDD analysis and indicators for age, race, national origin, rank at hire, years since degree, administrator status, fiscal year, and departmental affiliation. Robust standard errors appear in parentheses

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

Faculty, the Student Diversity, or the Success Circles committees had systematically lower turnover than would have been expected for female assistant professors, female full professors, and female professors in general. Thus, the evidence suggests that exposure to the design and implementation of the ADVANCE activities at UnU was an effective treatment in and of itself.

Climate Survey Results

Turnover, of course, is not the only important outcome for ADVANCE. Job satisfaction, happiness, and turnover intentions are also important measures and can help predict future retention.

To parallel our work with faculty retention, our first analytical step for the climate survey data explored the relationship between the climate scales and an indicator for whether or not the respondent indicated an affiliation with a target department. Individuals who did not indicate a departmental affiliation were excluded from the analysis.

As Table 7 illustrates, we find no evidence that being affiliated with an ADVANCE target department had any power to explain change in the climate perceptions of female faculty members between 2009 and 2013. None of the DDD interaction terms were significantly

Table 7 Marginal Effects from an Analysis of Faculty Climate

	Career Satisfaction	Job Satisfaction	Life Satisfaction	Turnover Intentions	Burnout
Female	-0.121 (0.123)	-0.101 (0.158)	-0.362*** (0.130)	-0.0105 (0.166)	0.254** (0.102)
Associate Professor	-0.171*** (0.0579)	-0.118 (0.0826)	-0.0772 (0.0662)	0.0453 (0.0880)	0.0748 (0.0539)
Full Professor or above	0.0183 (0.0575)	0.0181 (0.0818)	0.154** (0.0641)	-0.252*** (0.0864)	-0.170*** (0.0507)
POST	-0.126 (0.102)	-0.202 (0.131)	-0.144 (0.0994)	0.0251 (0.137)	0.0659 (0.0869)
Treated	-0.00525 (0.107)	0.140 (0.133)	-0.135 (0.106)	-0.194 (0.145)	0.114 (0.0899)
Treated* Female	-0.204 (0.160)	-0.305 (0.207)	0.202 (0.187)	0.251 (0.252)	-0.0707 (0.156)
POST*Treated	-0.00919 (0.125)	-0.213 (0.164)	0.0602 (0.126)	0.405** (0.174)	-0.0478 (0.108)
POST*Female	-0.0205 (0.146)	-0.186 (0.195)	0.0688 (0.156)	0.261 (0.203)	-0.0299 (0.124)
POST*Treated* Female	0.160 (0.197)	0.420 (0.266)	-0.0479 (0.229)	-0.375 (0.308)	-0.0455 (0.192)
Constant	3.588*** (0.100)	3.648*** (0.124)	3.655*** (0.0948)	2.543*** (0.126)	2.358*** (0.0821)
Observations	1,238	1,209	1,194	1,216	1,195

Note: Treated is an indicator for a department targeted by the NSF ADVANCE program (i.e., a STEM or College of Agriculture department regardless of committee involvement). POST is an indicator for the 2013 climate survey. Robust standard errors appear in parentheses

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

different from zero. This is not surprising because most of the ADVANCE interventions were still in the design phase in 2013. We do, however, find evidence that exposure to ADVANCE committees had an effect. Exposure to committee work significantly increased several climate factors for female faculty members. As Table 8 demonstrates, departments containing members of specific ADVANCE program design committees experienced increases in female job satisfaction as well as decreasing intentions to exit and feelings of burnout among female faculty. These findings support the idea that being on a decision-making committee can increase job satisfaction and retention.

Discussion and Conclusion

Whether or not they partner with the NSF ADVANCE program, institutions of higher education are seeking interventions that improve work climate, enhance professional success, and increase recruitment and retention of female faculty in STEM disciplines. Our analysis, which builds on previous research highlighting the link between employee involvement and job satisfaction, suggests that high involvement work processes—particularly those aimed at addressing issues of faculty concern—can have a positive impact on faculty retention and job satisfaction.

The finding that departments that had exposure to any ADVANCE committee had a 3 percentage point lower annual turnover rate among female full professors than would have otherwise been expected was somewhat unexpected, as most ADVANCE activities have focused on assistant and associate professors. However, turnover among female full professors

Table 8 Selected Marginal Effects (Coefficients) from the DDD Analysis of Climate and Engagement in the ADVANCE Design Process

	Career Satisfaction	Job Satisfaction	Life Satisfaction	Turnover Intentions	Burnout
Committee Exposure Indicator					
Any Committee	0.218 (0.195)	0.477* (0.272)	0.094 (0.232)	-0.593* (0.312)	-0.166 (0.188)
Workshops for Future Women Faculty	0.587* (0.300)	0.808* (0.451)	0.437 (0.363)	-0.466 (0.502)	-0.473* (0.266)
Success Circles	0.534* (0.306)	1.106** (0.473)	0.409 (0.355)	-0.405 (0.549)	-0.327 (0.285)
ADVANCE Speaker Series	0.392* (0.228)	0.569* (0.336)	0.169 (0.283)	-0.531 (0.389)	-0.236 (0.223)
Staff Development Training	0.503 (0.335)	0.987** (0.460)	0.346 (0.396)	-0.745 (0.555)	-0.141 (0.313)
Administrative Fellows	0.134 (0.307)	1.058*** (0.404)	0.178 (0.357)	-0.743 (0.521)	-0.165 (0.287)
Departmental Mini-grant	0.196 (0.338)	0.540 (0.456)	0.485 (0.394)	-0.850* (0.485)	0.046 (0.294)
Department Head Workshops	0.055 (0.388)	0.569 (0.603)	0.300 (0.433)	-0.959 (0.631)	-0.146 (0.395)
Award and Search Committee Training	0.340 (0.251)	0.562 (0.375)	0.304 (0.293)	-0.202 (0.436)	0.008 (0.245)
Student Diversity	0.305 (0.373)	0.770 (0.500)	0.223 (0.463)	-0.643 (0.610)	-0.210 (0.340)
Scholars Program	0.406 (0.261)	0.629* (0.378)	0.065 (0.323)	-0.368 (0.464)	-0.252 (0.261)
Observations	1,238	1,209	1,194	1,216	1,195

Notes: Committee exposure indicators were attached to the climate survey based on the respondent’s self-report of their departmental affiliation. Respondents who did not provide information about their departmental affiliation have been excluded from the analysis. Each cell represents the coefficient from the treatment effect (i.e. the coefficient on the interaction between indicators for female, the POST period, and the designated activity committee) from a separate regression. The specifications mirror those in Table 6. Robust standard errors appear in parentheses

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

could have been impacted by ADVANCE because the faculty members themselves were exposed to the design and implementation of the ADVANCE activities through participation on ADVANCE design committees or because their friends and colleagues participated on the committees. The evidence suggests that exposure to the design and implementation of the ADVANCE activities at UnU was an effective treatment in and of itself.

Our results suggest there is an important aspect to committee membership that institutions of higher education may want to focus on to improve the retention of their faculty members. Committee membership represents an onerous waste of time if the members feel that their input is not appreciated and influential; institutions may balance the load a committee membership represents by allowing the committee to make decisions and then support the committee’s decisions and activities. If committee members feel that their service is important and valued, this perception may lead to higher satisfaction and lower turnover. Conversely, undervalued service may lead to lower job satisfaction and increasing intention to leave. One way to address such issues may be to model committee work after high involvement work processes, whereby employee involvement in decision-making is sought after and utilized.

Clearly, our analysis does not suggest that similar benefits should be expected from committee work that cannot be characterized as a high involvement work process. Much of the work of standard university committees provides neither “perceived influence” (Welch and Jha 2016) nor “real authority” (Fjortoft 1993), and it does little to “combat challenging climates” (Griffin et al. 2011) and therefore cannot be linked logically or empirically with positive outcomes. However, the results from our analyses do suggest that institutions of higher education may want to add membership on effectual, substantive committees, such as those addressing equity concerns, to their toolkit of interventions designed to improve retention and satisfaction of female faculty members.

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References

- American Psychological Association (2015). *Creating healthy workplaces*. Retrieved from <http://www.apaexcellence.org/resources/creatingahealthyworkplace/>
- Baez, B. (2000). Race-related service and faculty of color: Conceptualizing critical agency in academe. *Higher Education*, 39, 363–391.
- Butts, M. M., Vandenberg, R. J., DeJoy, D. M., Schaffer, B. S., & Wilson, M. G. (2009). Individual reactions to high involvement work processes: Investigating the role of empowerment and perceived organizational support. *Journal of Occupational Health Psychology*, 14, 122–136.
- Cammann, C., Fishman, M., Jenkins, G. D., & Klesh, J. R. (1983). Assessing the attitudes and perceptions of organizational members. In S. E. Seashore, E. E. Lawler III, P. H. Mirvis, & C. Cammann (Eds.), *Assessing organizational change: A guide to methods, measures, and practices* (pp. 71–138). New York, NY: Wiley.
- Cotton, J. L., Vollrath, D. A., Froggatt, K. L., Lengnick-Hall, M. L., & Jennings, K. R. (1988). Employee participation: Diverse forms and different outcomes. *Academy of Management Review*, 13, 8–22.
- Curtis, J.W. (2011). *Persistent inequity: Gender and academic employment*. Retrieved from https://www.aaup.org/NR/rdonlyres/08E023AB-E6D8-4DBD-99A0-24E5EB73A760/0/persistent_inequity.pdf
- Demerouti, E., Bakker, A. B., Vardakou, I., & Kantas, A. (2003). The convergent validity of two burnout instruments: A multitrait-multimethod analysis. *European Journal of Psychological Assessment*, 18, 296–307.
- Fjortoft, N. (1993, May). *Factors predicting faculty commitment to the university*. Paper presented at AIR Forum '93: Forum of the Association of Institutional Research., Chicago, IL.
- Grawitch, M. J., Trares, S., & Kohler, J. M. (2007). Healthy workplace practices and employee outcomes. *International Journal of Stress Management*, 14, 275–293.
- Grawitch, M. J., Ledford, G. E., Jr., Ballard, D. W., & Barber, L. K. (2009). Leading the healthy workforce: The integral role of employee involvement. *Consulting Psychology Journal: Practice and Research*, 61, 122–135.
- Griffin, K. A., Pifer, M. J., Humphrey, J. R., & Hazelwood, A. M. (2011). (Re)Defining departure: Exploring black professors’ experiences with and responses to racism and racial climate. *American Journal of Education*, 117, 495–526.
- Gruber, J. (2005). *Public finance and public policy*. New York, NY: Worth.
- Hart, J. (2016). Dissecting a gendered organization: Implications for career trajectories for mid-career faculty women in STEM. *The Journal of Higher Education*, 87, 605–634.
- Institute of Medicine, National Academy of Sciences, & National Academy of Engineering. (2007). *Beyond bias and barriers: Fulfilling the potential of women in academic science and engineering*. Washington, DC: The National Academies Press.
- Johnson, H. L. (2016). *Pipelines, pathways, and institutional leadership: An update on the status of women in higher education*. Washington, DC: American Council on Education. Retrieved from <http://www.acenet.edu/news-room/Documents/Higher-Ed-Spotlight-Pipelines-Pathways-and-Institutional-Leadership-Status-of-Women.pdf>

- Mohr, R. D., & Zoghi, C. (2008). High-involvement work design and job satisfaction. *Industrial and Labor Relations Review*, *61*, 275–296.
- Ohmer, M. L. (2007). Citizen participation in neighborhood organizations and its relationship to volunteers' self- and collective efficacy and sense of community. *Social Work Research*, *31*, 109–120.
- Ongori, H. (2009). Managing behind the scenes: A view point on employee empowerment. *African Journal of Business Management*, *3*, 9–15.
- Phipps, S. T. A., Prieto, L. C., & Ndinguri, E. N. (2013). Understanding the impact of employee involvement on organizational productivity: The moderating role of organizational commitment. *Journal of Organizational Culture, Communications & Conflict*, *17*, 107–120.
- Rosser, V. (2004). Faculty members' intentions to leave: A national study on their worklife and satisfaction. *Research in Higher Education*, *45*, 285–309.
- Smart, J. C. (1990). A causal model of faculty turnover intentions. *Research in Higher Education*, *31*, 405–424.
- Welch, E.W., & Jha, Y. (2016). Network and perceptual determinants of satisfaction among science and engineering faculty in US research universities. *Journal of Technology Transfer*, *41*, 290–328.
- Wheeler, L. (1966). Toward a theory of behavioral contagion. *Psychological Review*, *73*, 179–192.