



Is There a Gendered Path to Tenure?:
A Multi-State Approach to Model the
Longitudinal Dynamic Nature of Academic
Trajectories of Doctoral Recipients in the US

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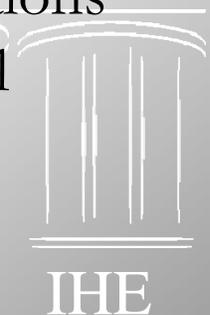
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Introduction of Topic

- In 2011, 40% T and TT faculty were women and 21% minority (Digest Educational Stats, 2013)
- Majority of past literature finds women faculty to receive lower pay, less productive, take more PT and NTT appointments
- Why? – unfriendly climate, unclear expectations, conflicts with family needs
- Also gender schemas and unconscious biases affect perceptions of individuals and their work as well as some organizational structures that contribute the ‘leaky pipeline’



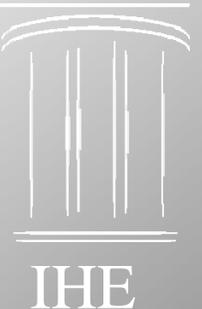
Recent Studies

- However— recent studies show less or no differences between men and women in higher education
 - Choice of major (less)
 - Entrance into doctoral programs
 - Entrance into academic appointments
 - Productivity and citation rates
- Ceci, Ginther, Kahn & Williams (2014)
- van Arensberger, van der Weijden & van den Besselaar (2012)
- Sandström & Hallsten (2008)
- van den Besselaar & Sandström (2016)



Purpose of Study

- Where are we today?
- To examine individual, institutional, and early employment factors that contribute to career paths of women and men in postsecondary academic appointments
- Provide info on recent doctoral recipients in the sciences
- Bifurcation of tenure-track and NTT paths may contribute to the loss of talented women who can contribute to student learning and knowledge production



Research Questions

- What demographic and institutional characteristics predict an individual's receipt of tenure or tenure-track position at institutions with a tenure system?
 - Are there differences by gender and/or race?
 - Are there differences by marital status and number of dependent children?
 - Are there differences by discipline and/or type of degree-granting institution (i.e., Carnegie classification)?

In addition, the proposed study aims at capturing the “dynamic nature” of the academic trajectories of faculty members by asking:

- Do changes in faculty characteristics updated across time explain movements between categories, including decisions to leave the academic profession?
- Is there evidence of possible differences in the influence of predictors for tenure-related appointments between the academic trajectories of female and male faculty members?
 - Are there differences by race or ethnicity, discipline, marital status and/or number of children? and
 - Does receipt of a postdoctoral appointment have a significant influence?



Conceptual Framework

- Guided by human capital theory – enhancement of individual on society, to include knowledge, understandings, talents, and skills (Becker, 1993; Paulsen, 2001)
- And organizational and structural theories- as they relate to academic careers, labor markets, and cultural norms. Some scholars argue that organiz. structures sort and reward individuals differently (e.g., Bobbit-Zeher, 2007; Pfeffer, 1983; Youn, 1992)
- Geographic mobility is important for upward career advancement (Rosenfeld & Jones, 1986), especially during times of economic constriction and job market declines



Literature Guiding the Study

- Despite their gains, women are not tenured at the same rate that they are earning doctoral degrees ([Ehrenberg & Kuh, 2009](#); [Mandleco, 2010](#))
- Women are less likely to obtain tenure-track positions and tenure, and are less likely to be promoted to full professor compared to male counterparts ([Mason, Goulden & Wolfinger 2013](#))
- In 2011, 39% of all tenured and tenure-track faculty in the United States were female and 18% were minority ([Knapp et al., 2010](#))



Major Areas of Literature on Women and the Pursuit of Faculty Appointments

- Gender, Race, Age, Spatial Visualization & Math Ability
- Clarity in the P&T Process
- Mentoring
- Family Formation and Parenthood
- Ideologies Related to Work & Role Compatibility and Self-Efficacy



Data and Method

- Data from 2003 through 2013 *Survey of Doctorate Recipients*
- Retrieved from 2003 SDR doc completers 1999-2003 who initiated employment within 5 years of degree completion
- Approx. 2,350 respondents in the five waves of data

- Women= 960 (37.3 yrs); Men = 1360 (36.1 yrs)
- 68% US Born
- 63% White Race
- 67% earned degree at Public Institution; 72% R1
- 15% took at least one postdoctoral appointment



Time Variant Characteristics (select)

Table 6
SDR Recipient Demographics That May Change Over Time

Variable	Levels	N ₂₀₀₃	% ₀₂₀₀₃	N ₂₀₀₆	% ₀₂₀₀₆	N ₂₀₁₀	% ₀₂₀₁₀	N ₂₀₁₃	% ₀₂₀₁₃	N ₂₀₁₅	% ₀₂₀₁₅	N _{all}	% _{0all}
Married	0	720	30.7	600	25.3	550	23.6	500	21.1	460	19.5	2820	24.0
	1	1630	69.3	1750	74.7	1800	76.4	1850	78.9	1890	80.5	8920	76.0
	all	2350	100.0	2350	100.0	2350	100.0	2350	100.0	2350	100.0	11750	100.0
Education	0	980	41.6	1060	45.0	1120	47.8	1120	47.5	1130	47.9	5400	45.9
	1	1370	58.4	1290	55.0	1230	52.2	1230	52.5	1220	52.1	6350	54.1
	all	2350	100.0	2350	100.0	2350	100.0	2350	100.0	2350	100.0	11750	100.0
Government	0	2150	91.6	2150	91.4	2120	90.1	2110	89.9	2130	90.5	10660	90.7
	1	200	8.4	200	8.6	230	9.9	240	10.1	220	9.4	1090	9.3
	all	2350	100.0	2350	100.0	2350	100.0	2350	100.0	2350	100.0	11750	100.0
Bus_Indus	0	1570	66.8	1490	63.6	1460	62.1	1470	62.6	1450	61.6	7440	63.3
	1	780	33.2	860	36.4	890	37.9	880	37.4	900	38.4	4310	36.7
	all	2350	100.0	2350	100.0	2350	100.0	2350	100.0	2350	100.0	11750	100.0

Additional Demographics

Table 7

Descriptive Statistics of Dependent Variable and Covariates

Variable	Level	N	\bar{x}	s	Min	Max
Salary	Fem2003	960	72042.7	31817.5	9.0	245100.0
	Male2003	1390	84464.2	49389.8	110.9	838500.0
	Fem2006	960	79083.2	35471.2	29.5	354000.0
	Male2006	1390	93156.4	46155.6	29.5	590000.0
	Fem2008	960	91423.8	38195.6	2331.0	388500.0
	Male2008	1390	109651	54365.9	1998.0	666000.0
	Fem2010	960	99021.4	51402.1	0.0	717220.0
	Male2010	1390	115475.0	58245.2	0.0	763000.0
	Fem2013	960	100396.0	52217.1	0.0	718521.7
	Male2013	1390	121275.0	74560.1	0.0	1020000.0
Years Since Grad	Fem2003	960	3.3	1.3	1.0	5.0
	Male2003	1390	3.3	1.3	0.0	5.0
Time To Degree	Fem2003	960	9.2	5.1	3.0	36.0
	Male2003	1390	8.5	4.4	3.0	33.0

Multi-State Analysis of Career Trajectories

- A multi-state analysis of mobility completed; describes how individual movement between five statuses in continuous time: tenure, on-tenure track, non-tenure-track and non-postsecondary appointments
- In this study, 'state' refers to the faculty member employment position or condition



Figure to Represent Six States After Initial Academic Appointment

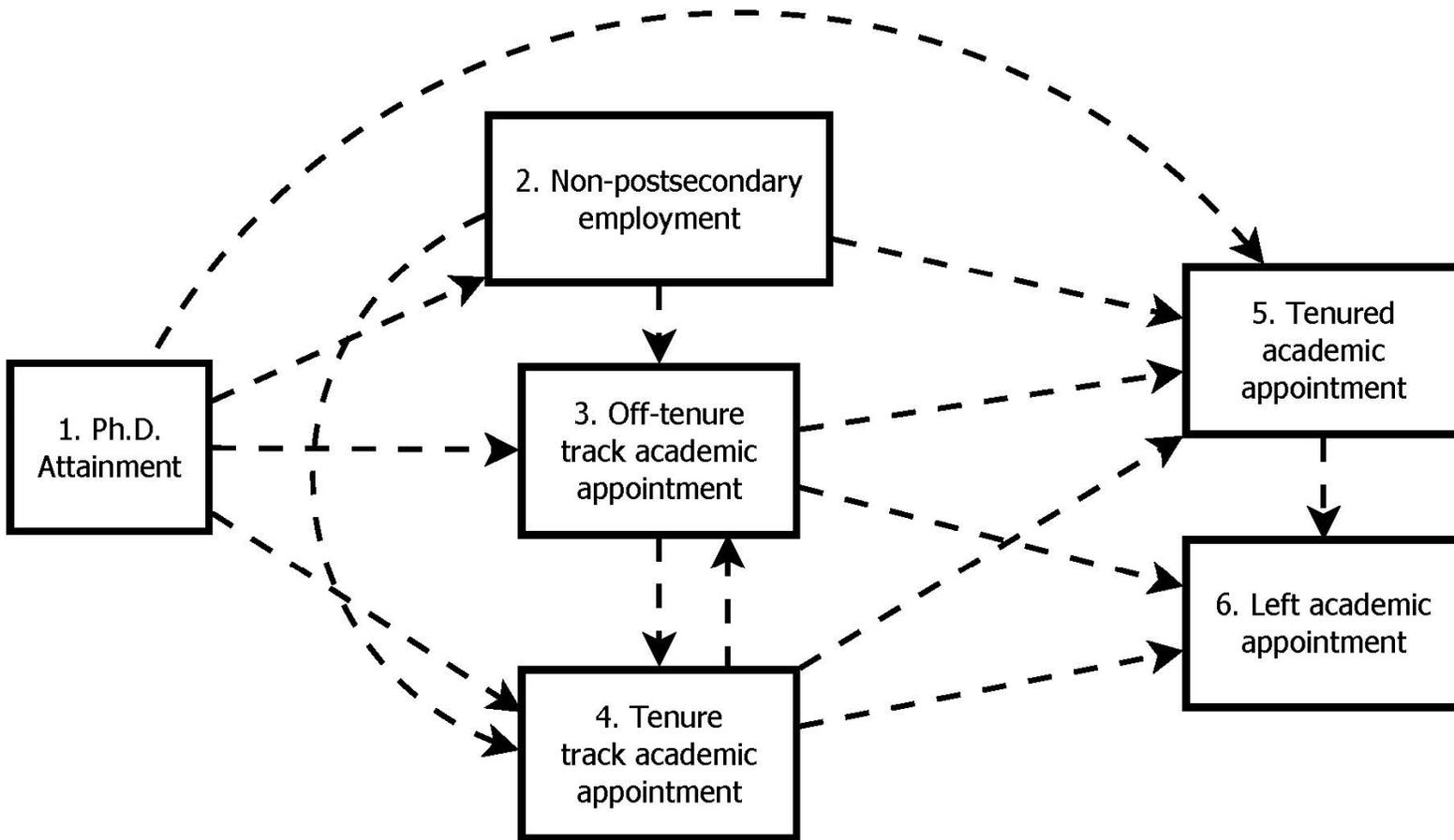


Table 1
Transition matrix of allowable paths shown in Figure 1

	Ph.D. Attnmt	Apptmt Outside Postsec Institution	NonTenure- Track	Tenure-Track	Tenured	Left Postsec Employment
Ph.D Attnmt	NA	1	2	3	4	NA
Apptmt Outside Postsec Inst.	NA	NA	5	6	7	NA
NonTenure- Track	NA	NA	NA	8	9	10
Tenure-Track	NA	NA	11	NA	12	13
Tenured	NA	NA	NA	NA	NA	14
Left Postsec Employment	NA	NA	NA	NA	NA	NA

Select Findings

- Propensity Score Match showed overall no significant evidence of gender difference in entering postsecondary employment sector (thus no evidence of selection bias)
- Multi-state Model – three main areas of analysis
 1. Taking or Remaining in an Academic Appointment vs. Appointment Outside Postsecondary Ed. Sector
 2. Being in a Tenure-Related vs. Non-Tenure Track Position
 3. Being in a Tenure vs. Tenure-Track Position



1. Taking or Remaining in an Academic Appointment vs. Appointment Outside Postsecondary Ed. Sector

- Journal publications at time of 1st appointment increased likelihood of beginning career in the academy (m & w but coefficient gtr for women)
- Engineer majors more likely to hold appointment outside academia
- Type of institution from degree, race/ethnicity, US Born status did not have effect



Probability to Remain in Academic Appointment at T1

- Number of published articles remained significant for both m & w
- For women- teaching and research activities significant predictor to remaining in academy, for men only teaching
- Women with degree in engineering, physical sci, biology, and agric sci less likely to hold academic appointment than female peers in social sciences.
- Native Amer. & African Amer. men more likely to hold academic appt than white men
- Having held a postdoc was influential



Probability to Remain in Academic Appointment at T2

- Magnitude of coefficients start to converge toward zero – indicates changes in the trajectories over time
- Publications remain signif. predictor of remaining
- Participation in research & teaching strong predictors for men
- Holding a management or administration position was associated with keeping academic appointment (compared to ‘other’ activities)



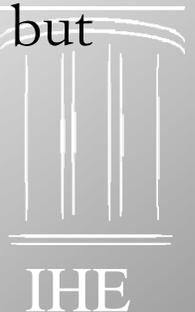
Probability to Remain in Academic Appointment at T3

- Published journal articles remain significant
- Compared to other activities, participation in mgmt & administration more important for women than men to remaining in or holding academic appointment
- Compared with social sciences, those from engineering, phys sci, biology, agric sci, and psychology were more likely to not hold or remain in an academic appointment.



Probability to Remain in Academic Appointment at T4

- Similar findings as seen for Time 3 – journal pubs, teaching, research, administration were positive and significant predictors
- Native American women less likely to remain; Native American men more likely to remain. No other race differences.
- Level of doctoral degree institution was not significant
- Postdoctoral appointment no longer influential for women, but remained for men



2. Being in Tenure-Related Vs NT Position T0

- Publications not predictor here
- Teaching & research activities signif and positive
- Institution- men from comprehensive univ 10% less likely to hold tenure-related appt compared to research university
- Female & males in social sci more likely to hold tenure-related appt. than peers in math, stats, biology, agric, and psychology
- Holding a postdoc appointment associated with decreased likelihood 50% of holding a tenure-related appt (expected)



Being in Tenure-Related Vs NT Position

T1

- Teaching and research activities continue to be important predictors
- Degree in biology or psychology continued assoc. with decreased likelihood of tenure-related appt.
- Females in computer science more likely to hold tenure-related appt.
- Female Native Americans more likely to hold tenure-related appt. than male NA; Hispanics more likely than white peers.



Being in Tenure-Related Vs NT Position T2

- Journal articles published remained strong predictor for women
- Teaching activities remain important predictor for men and women
- Research important predictor for men
- Negative effect of postdoc now diminished
- Men in engineering, phys sci, biology, agric sci or psychology negatively assoc with moving to tenure-related appt (compared to soc sci)



Being in Tenure-Related Vs NT Position T3 (2010)

- Models show stabilization, few changes observed
- Publications still strong predictor
- Negative effect of postdoc indistinguishable from zero
- Hispanic male and Native American females more likely than white counterparts to hold tenure-related appts.



Being in Tenure-Related Vs NT Position T4 (2013)

- First time – married becomes signif & positively associated with likelihood holding a tenure-related appt. – both men and women
- Teaching and research activities important predictors for women, teaching for men.
- Females in computer science more likely to hold tenure-related appt than peers in soc sci.
- Asian, African Amer, & Hispanic males more likely to hold a tenure-related appt than male peers
- Native American women more likely than white women to hold tenure-related appt.



Tenured V. Tenure-Track Comparisons

- Details can be found in paper



Discussion

- Much of previous literature found strong evidence of gender bias for women in faculty appointments
- But a few more recent studies show no or fewer differences
- Here, we found some evidence of differences between men and women
 - Emphasis on teaching v. research v. administration activities
 - Native American and Hispanic women more likely to hold tenure-related appointment
 - Females in computer science more likely to hold tenure-related appointment
 - Salary lower
 - Time to degree longer
- But overall findings show no strong evidence of gender discrimination for entry into and through the first decade after doctoral degree completion



Discussion 2

- Are today's doctoral recipients more equal in their output? And perhaps their internal drive and self-efficacy as a faculty member?
- Ceci, Ginther, Kahn, & Williams (2014); van Arensberger, van der Weijden & van den Besselaar, 2012) found young women faculty to perform on par with male peers
- But Van den Besselaar & Sandström (2016) found that differences in research performance emerge only later in the academic career. Ten years later men had 17% more pubs and a mean productivity rate 31% higher than women peers.

Discussion 3

- Discipline made a difference – those from engineering more likely to seek employment outside academia. Also true to lesser degree for phys sci, biology, agric sci, and psychology
- Institution made a difference – men with degree from a comprehensive university were 10% less likely to hold a tenure-related appointment.
- Marriage and children do not show much effect; Maybe too early for us to see differences



Implications

- Keeping doctoral recipients in academia is important for strong profession
- Women faculty serve as role models and mentors for students
- Consider policies that ensure women are welcomed, encourage leadership in administration but not at the expense of faculty duties
- Ensure policies that limit time in postdoc appointments



Questions?

Thank you

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Any omissions or errors are our own

