Women's Careers in Academic Social Science: Progress, Pitfalls, and Plateaus

Donna K. Ginther
Professor, Department of Economics
University of Kansas
Lawrence, KS 66045
Email: dginther@ku.edu

and

Shulamit Kahn
Associate Professor
Department of Markets, Public Policy and Law
School of Management
Boston University
Email: skahn@bu.edu

Abstract:

Many studies have shown that women are under-represented in tenured ranks in the sciences. Here, we evaluate whether gender differences in the likelihood of obtaining a tenure track job, promotion to tenure, and promotion to full professor exist in the social sciences controlling for background and productivity characteristics. Using the 1981-2008 Survey of Doctorate Recipients, we find first that women with children are less likely than similar men to enter track jobs but not single childless women, suggesting that women's entry into tenure-track academia is dominated by choice rather than by any discrimination at hiring. We find that ceteris paribus gender differences in tenure award existed in the cohort of 1980s PhDs but disappeared for the cohort of 1999 PhDs. The exception is the field of economics, where at least the probit analysis suggests a gender difference of approximately 20% that has not disappeared and is even larger for those single and childless. Finally, we find that there does seem to be gender differences in promotion to full in social science as a whole and in economics, sociology and anthropology/linguistics.

JEL Codes: J4, J71

Key words: Science, gender discrimination, salary, promotion.

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I. Introduction

Academic careers consist of a series of milestones: the doctorate, tenure track employment, and promotion through the ranks to tenured full professorships. While several researchers, including us, have examined career outcomes for women in science disciplines where they are traditionally underrepresented, few studies have examined academic careers for women in the social sciences. This chapter begins from the point when social scientists receive their PhDs and investigates gender differences in career milestones as women move up the academic career ladder, getting tenure track jobs, being granted tenure, and being promoted to full professorships.

Although women now make up the majority of US undergraduate students, as one traverses the hierarchy of academia, women make up smaller percentages of graduate students, assistant professors, and tenured faculty. This is especially true in physical science and engineering disciplines (Long et. al. 2001, Ginther 2006a, Ginther 2006b). There is a large body of literature about women and science, particularly since 1982 when Congress instructed the National Science Foundation (NSF) to report biennially on the status of women and minorities in science. The NSF reports have consistently shown that since 1982 and through the most recent report (NSF 2012), women continue to be less likely than their male colleagues to be full professors and more likely to be assistant professors. Two National Academies studies have examined women in academic science careers and the two have drawn opposite conclusions. Although the *Beyond Bias and Barriers* (National Academies 2006) report contains evidence of no gender differences in promotion to tenure in science fields (Ginther 2006a, Ginther 2006b), it concludes that discrimination and institutional barriers account for the under-representation of women in science careers. A subsequent study by the Academies, *Gender Differences at Critical Transitions in the*

Careers of Science, Engineering and Mathematics Faculty (National Academies 2011) finds no evidence of barriers in the hiring and promotion of women in the fields that were surveyed.

When researchers have studied social sciences, they have often included them with science disciplines. Long et.al. (2001) examines the careers of women in science and social science combined from 1973-1995 and conclude that women have been successful in moving "from scarcity to visibility." This conclusion, in part, results from combining all science and social science disciplines together. Women have made great strides in representation in the social sciences and life sciences relative to anemic gains in physical science and engineering. A recent analysis by the NSF (NSF 2004b) is provides a comprehensive study of the factors contributing to promotion in academic careers of scientists and social scientists combined. This work uses NSF's longitudinal Survey of Doctorate Recipients (SDR), the source we use in this paper, and finds that controlling for human capital, personal characteristics and institutional factors, there remains a significant female disadvantage in the likelihood of being in a tenure track job, of receiving tenure and of being promoted to full. However, in most of their specifications, they find that these gender differences become statistically insignificant when family characteristics are allowed to affect men and women differently. Ginther (2001, 2006a, 2006b) and Ginther and Kahn (2004, 2009) caution that one cannot generalize the findings from one academic discipline (science) to others (e.g. social science).

Few papers have examined gender differences in academic social science careers separately. Rudd, Morrison, Picciano, and Nerad (2008) report on data collected in the fields of anthropology, communication, geography, history, political science, and sociology. They find few gender differences in academic career milestones with the exception that men are slightly more likely to get tenure in these fields in Research I institutions. Morrison, Rudd, and Nerad (2011) use the same data as the previous study to examine gender differences in the effect of marriage and

parenthood on academic career milestones. They find that women are somewhat less likely to get tenure track jobs, but that women who are parents are more likely to get tenure track jobs. They also find no significant gender differences in promotion. However, these two studies do not include all social science disciplines, excluding the large fields of economics and psychology.

To preview our results, we find that *ceteris paribus*, women with children are less likely than similar men to enter tenure-track jobs but not single childless women, suggesting that women's entry into tenure-track academia is dominated by choice rather than by any discrimination at hiring. Further, we find that *ceteris paribus*, gender differences in tenure award existed in the cohort of 1980s PhDs but disappeared for the cohort of 1999 PhDs. The exception is the field of economics, where at least the probit analysis suggests a gender difference of approximately 20% that has not disappeared and is even larger for those single and childless. Finally, we find that there does seem to be gender differences in promotion to full in social science as a whole and in economics, sociology and anthropology/linguistics.

The remainder of the chapter is organized as follows: we first describe the present representation of women in social science academia and the trends that led to where we are now, and motivate the analysis in the rest of this chapter. We then discuss our data and methodology, before we move to the meat of our chapter: analyzing each of the three major academic milestones – starting in a tenure-track job, being awarded tenure, and being promoted to full professorship – in three separate sections. The final section concludes.

II. Social Science's Major Improvements in Women's Representation

Women have made great strides in doctorates awarded in the social and behavioral sciences. The NSF conducts a census of doctorates granted in the U.S. in its *Survey of Earned Doctorates (SED)*. Figure 1, based on the SED, shows that in 1974 just 33% of doctorates in social

and behavioral sciences were awarded to women. Rapid increase in female representation has occurred since that point, culminating in an average 57% female in 2010 among social science PhDs. Since 1990, a greater percentage of doctorates were awarded to women in the social sciences than in the humanities.

Have these gains carried over to women's representation in academia? To answer this, we use data from the 1981-2008 waves of the Survey of Doctorate Recipients (SDR). The SDR is a biennial, longitudinal survey of doctorate recipients from U.S. institutions conducted by the National Science Foundation[1] and is the data source for most of the analysis in this chapter.

Figure 2A shows the percentage female for social science as a whole with the three key tenure-track ranks: untenured assistant professors, tenured associate professors and tenured full professors. If men and women with recent PhDs had equal likelihoods of entering social science academia, the percentage female among tenure track assistant professors shown in Table 2A would mirror that of PhDs in the previous 6 or so years. For social sciences on average, in 1981, 30% of PhDs from the previous six years had been women, while 27% were of assistant professors were. By 2008, 56% of PhDs from the previous six years had been women, while about 50% of tenure track assistant professors were women, so that in both of these years, both sexes had approximately equal chances of getting a tenure track job. Moreover, both percentages female among PhDs and among tenure-track assistants showed remarkable increases over the past three decades, almost doubling.

Women's representation at the tenured associate level seems to be even more in line with the PhD pool feeding into it. For instance, it is reasonable to roughly assume that tenured associates tend to be from cohorts who received PhDs between 6 and 15 years earlier. In 1981, 21% of tenured associate professors were women. While we do not have exact PhD averages for

the entire 6-15 years prior to 1981, our earliest data point of 1974 (7 years earlier) had 23% of social sciences women and rising quickly. The 21% tenured associate figure seems to match this well. In 2008, the cohort of PhDs received the previous 6-15 years was 50% female, exactly matching the percentage female of tenured associate professors in 2008.

However, women are not represented in the top echelon of academia – full professors – in numbers anywhere their representation among full professors. In fact, in social science as a whole, in 2008 women were only 27% of full professors. We have to go back to 1976, 32 years previously, to find a similar female percentage of PhDs.

There is no *prima facie* evidence of sex-linked differences, therefore, at the stage of appointment to tenure-track jobs or at the tenure decision, but there does seem to be sex differences at the point of promotion to full professorship. However, we cannot tell whether the former similarity or the latter differences will remain once we try to compare similar men and women, similar with respect to background ability and similar with respect to productivity. Men and women may have radically different quality of PhD education. In terms of publications, research on data from the 80s and 90s shows that publication rates of women in science and engineering (S&E) have been lower than men (Stack 2004; Sax et. al 2002; Xie and Shauman 1998, 2003; Levin and Stephan, 1998; Bellas and Toutkoushian 1999). The gender differences are smaller once controls for teaching responsibilities are added (Bellas and Toutkoushian 1999; Xie and Shauman 1998, 2003) but it is difficult to know whether these additional responsibilities were imposed on women or chosen by them. Research on time series data finds that gender differences in publishing have narrowed substantially over time, suggesting a future convergence in women's and men's academic productivity. (Sax et. al 2002, Xie and Shauman 1998, 2003. Xie and Shauman found the male/female ratio narrowed from 58% in the late 1960s to 80% in 1993.)

[1] Prior to 1993, the SDR was administered by the National Research Council. Note that there was a two year gap from

Thus, a major goal of our analysis in this paper will be to control for background and productivity characteristics to study the progression of individuals through the major three milestones of academic success in the social sciences.

Moreover, career choice and productivity may be affected by family choices. Long et.al. (2001) find that the impact of marriage and children on women's careers in sciences including social science had largely been eliminated by 1995. However, men were still 4 percent more likely to receive tenure. On the other hand, Wolfinger, Mason and Goulden (2008) find that in academia as a whole, children reduce the likelihood that women take tenure track positions but have little effect on promotion to tenure. An impact of marriage and children on women's publications has been shown by Fox(2005) and Stack(2004), although not always in the direction one might expect. Fox (2005), using data from the 1990s, finds that older children slow women's research productivity but that older women with pre-school children are *more* productive than those with older children. Stack (2004) also finds that young children are positively correlated with publishing. However, Sax et. al. (2002) studying faculty at research universities find no significant impact of family characteristics on research productivity.

We revisit these issues in our study, comparing the impact of women and children on men and women's progress in their academic careers.

Finally, this chapter considers the separate fields within social science. Research by Ginther and Hayes (1999, 2003), Ginther (2001, 2003, 2004, 2006a, 2006b), and Ginther and Kahn (2004, 2009) demonstrates that employment outcomes and the impact of covariates differ by academic field. In particular, our previous work (Ginther and Kahn 2004) on economics identified substantial gender differences in promotion in economics, differences that surpassed those in the comparison fields of statistics, political science, and natural sciences.

2003 to 2006, and from then on the SDR is once again biennial, now administered in the even years.

Figure 1 also documents wide differences between PhD fields in the percentage female even within social sciences. Economics clearly has fewest women, with just 33% female in 2010. As seen in the figure, economics is most similar to physical sciences and lies far below most other fields shown, including life sciences. The only other social science field that continues to have less than 50% of its PhDs awarded to females is political science, which reached 42% female by 2010. The same under-representation of women in economics spills over to academic employment, where only 11% of full professors and less than 30% of assistant and associate professors were women.

Together, this evidence suggests that it is necessary to separately analyze fields within social sciences. Therefore, our analyses are estimated separately for specific fields, dividing the social sciences into economics, psychology, sociology, political science, and other social sciences (in which the largest two fields are anthropology and linguistics) as long as we had sufficient numbers of observations to do so. Further, because a relatively large percentage of PhDs in clinical psychology choose clinical rather than academic careers, we analyze the tenure-track transition separately for clinical and other psychologists. Although some fields are quite small particularly as we move up the promotion ladder (see Table 1), our analysis shows that even within the smaller fields, many gender differences are large enough to be statistically significant.

The analysis of economics here also updates our previous 1994 work by examining SDR data based on SDR data from 1973-2001 to a somewhat later period – from 1981-2008. Also, of course, it performs similar analysis on all other social sciences.

III. Data and Empirical Methodology

As we said above, our analysis of promotion uses data from the 1981-2008 waves of the NSF's biennial, longitudinal survey, the SDR. The SDR collects detailed information on doctorate

recipients including demographic characteristics, educational background, employer characteristics, academic rank, government support, primary work activity, productivity, and salary. We use the SDR from 1981 to the last year of SDR microdata available, 2008. The SDR has undergone substantial changes in the sampling frame and survey content between the 1981 and 1993 waves (Mitchell, Moonesinge, and Cox 1998). Technical reports provided by the National Science Foundation have allowed us to construct a longitudinal data set with consistent variable definitions over time.

We have selected a longitudinal extract of doctorate recipients in the social and behavioral sciences, thus including psychology, who received their PhD between the years of 1981 and 2007 (although for the analysis of promotion to full we start with the 1979 PhD cohort.) We exclude individuals who are not observed early enough or long enough for each specific analysis, as explained below.

Dependent Variables

We estimate three career milestones. First, we examine the probability of obtaining a tenure track job within six years of the PhD using probit analysis. For this, we include everyone observed by the SDR at approximately six years[2] post-Ph.D and consequently we limited our consideration to those who received PhDs before 2003 PhDs (who were thus able to be observed 6 years post-PhD in 2008.)

Next, we restrict the analysis to those who held a tenure track job within six years of their PhD to analyze the first award of tenure. Tenure award is modeled both using probit and Cox semi-proportional hazard methodologies. For the probit analysis, we modeled the probability of receiving tenure within approximately 11 years of PhD and thus excluded those who received their

[2] Because of the biennial nature of the SDR and the fact that respondents sometimes skipped one or two surveys, we could not only include people observed at six years exactly. Instead, we included people if they had been observed some time during years 1-6 and were observed at least once between years 5 and 10.

PhDs after 1998, those who did not hold a tenure track job within six years of their PhD, and also those who were not observed at approximately 11 years post-PhD.[3] The hazard analysis models time from PhD until tenure, again limiting the population to those who held a tenure track job with 6 years.

For the probit analysis of full professorship, we model the probability that someone who had been tenured with 11 years of PhD to received promotion to full professorship within seven years of being tenured. We therefore include only those who were observed at approximately seven years post-tenure receipt and exclude those who received their PhDs after 1995. In order to add observations, we extend the full analysis back to 1978 PhDs.

A major difference between the hazard analyses and the probit analyses is that in the hazard analysis, we are able to include people regardless of the length of time they were observed (i.e. either since PhD or since tenure receipt) because the hazard analysis merely considers everyone who drops out of the survey before that time as censored. The hazard analysis therefore allows us to include more observations, to include people from later cohorts, and to capture the entire year-by-year pattern of promotion.

From the 1981 through 1991 surveys, respondents provided the exact year that they received tenure, which adds some accuracy given the biennial nature of the survey. For later surveys, tenure year is imputed as the first year a person is observed with tenure in the sample. We impute the year a person receives full professorship as the first year a person is observed as a tenured full professor in the sample. Therefore, given the biennial nature of the survey, years until

[3]The algorithm we used was complicated, in order to include as many people as possible since the number of social science PhDs who had been on the tenure track and were interviewed by the SDR is limited. First, if the person was not observed during year 11, we looked instead at year 12. If not observed in either of those years, we looked at year 10 and then at year 13. However, because people who do not receive or did not expect to receive tenure were more likely to drop out of the SDR, we did the following. If they were last observed in the SDR any time between year 6 and year 9 post-PhD, we included them as tenured if they were tenured at all during that period, and as untenured if they were never observed tenure and were in non-tenure-track academia or outside of academia when last observed.

tenure and years until full professor may be measured with an error of +/- one year.

Table 1 gives means of the dependent variables and the numbers of observations in each probit analysis. The number of observations in each hazard rate analysis is given along with hazard results in Table 6. All averages and analyses are weighted.

Control variables

All specifications include non-time varying control variables that describe the person's background and education: PhD year, gender, race, field, whether a citizen and whether a temporary resident at PhD receipt or any time within six years of PhD, and the person's PhD institution's quality. The PhD quality is measured by dummy variables based on rankings from the Carnegie Foundation for the Advancement of Teaching and of Comprehensive and Liberal Arts Institutions. We also include the National Resource Council's ranking of the person's PhD department, although this involved some imputing and thus may be a very noisy indicator.[4] Gender-specific means of the background variables at the different stages of academic careers are given in Table 2.

Given the large increase in female labor force participation and in higher education rates of women over the past half-century, we wanted to test whether any gender differences we identified in social science academia were decreasing during the period of 1981 to 2008. We therefore ran additional specifications with an interaction term between PhD cohort and the female dummy. For these specifications, we report the implied gender differences for both the 1981 PhD cohort and the 1998 PhD cohort.

This process allowed us to categorize all but 4 people last observed between years 6 and 9 (among the set of people who had been tenure track by year 6), assuring us that we had not introduced selection bias.

[4]Specifically, we use 1993 Carnegie tier for those with PhDs after 1987 and 1982 tiers for earlier PhDs. We use 1994 NRC ratings for those with PhDs after 1988 and the 1987 rankings for earlier PhDs, adjusting the 1987 ratings for the overall shift in NRC rankings between 1987 and 1994 and imputing missing ratings based on other evidence.

Some specifications also include marriage and children variables interacted with gender. Since family characteristics vary over time, these family variables are converted into dummies for whether they equal one at any time during the relevant period. For instance, the married variable for the tenure track analysis equals one if the person was married anytime during the first 6 years post-PhD, for the tenure analysis anytime during the first 11 years and for the full analysis anytime between tenure receipt and 7 years after. However, our category "single no children" takes a value of one only if the person was single with no children for all of the relevant period, and our category "only older children" takes on the value of one if the person has older children sometime during the period, but has no younger children (<6 years) at any time during the period. The dummy variables we create in this way are then multiplied by a female and male dummy respectively and the interactions terms are included instead of the female dummy. This allowed us to answer questions such as "What is the effect of marriage on women?" or "How do single women and men compare?" The gender-specific means of some of the family variables at the different stages of academic careers are given in the middle panel of Table 2. Note that family situations that are relatively rare (given the life stage being modeled) will have large standard errors for their gender difference, a point that we return to in later discussion.

We report results for what we deem to be the most important family-related questions in a separate table (Tables 6 and 8). Note that we also have estimated the promotion hazard equations using time-varying contemporaneous family dummy variables each year, rather than a dummy for whether the person fell into a specific family category anytime during the relevant time span. However, the specification with contemporaneous family variables had less predictive power and therefore is not reported here.

The last column of Table 4 and 5 (tenure and full analyses) add to the background characteristics additional variables that relate to the person's employer type, work activities and

publications, all added to capture or proxy the productivity of the person.[5] This includes whether the employer is a Research I university, whether the employer is a Research II University, whether the employer is a Liberal Arts I college, whether the primary or secondary work activity was research, whether the primary work activity was teaching, whether the person received government support, and a limited publications measure. Measures of publications are largely missing from the SDR data, but the SDR does ask questions about refereed articles in the 1983, 1995, 2001, 2003 and 2008 surveys. The 1983 question refers to publications between 1980 and 1983 whereas the 1995--2008 questions refer to numbers of publications in the previous five years. We use these data to create rough measures of refereed articles published per two-year period. Although this variable is clearly inaccurate since it is based on averages over several years, it nevertheless seems preferable to omitting the information altogether.

These "productivity" variables were converted to means over the relevant period for the probit analyses (for instance, for the tenure analysis, the percentage of surveys observed during the first 11 years post-PhD that the person worked in a Research I university). The bottom panel of Table 2 gives the gender-specific means of these variables.

We realize that these variables as well as the family variables may be picking up unobserved heterogeneity rather than causality and are careful to clarify their possible interpretations in the discussion below.

Finally, note that although Tables 3-8 show the gender differences but not the coefficients of other covariates. The entire equations are available upon request from the authors.

IV. Stepping Onto the Academic Career Ladder

A PhD in the social sciences – with the exception of clinical psychology – tends to be only

[5] Employer and other productivity as careers unfold cannot be included in the models of whether PhDs get tenure

absolutely necessary (as opposed to be advantageous) for being tenure-track faculty in institutions of higher education. Moreover, professors in these fields often socialize their PhD students into believing that a tenured job in academia is the most prestigious job on could do with their PhD. Nevertheless, the majority of PhDs do not enter a tenure-track job within six years of receiving their PhD in many social science fields, as Table 1 shows. This section analyzes the likelihood of obtaining a tenure track job. Of the three milestones studied here, this is the one most likely to be a complex combination of supply – the choice of the PhD to enter this career track – in addition to demand – the choice of departments to hire the person.

As mentioned earlier, Figure 1 illustrates the continuous growth in the percentage of the PhD's granted in social science going to females in all fields between 1974 and 2010, almost doubling (from 24% to 57%). The top row of Table 1 gives the percentage of females and males who are observed in tenure-track jobs within (approximately) the first 6 years post-PhD for social science as a whole. Fewer women than men have tenure track jobs within six years of PhD receipt: 37 percent of men compared to 27 percent of women.[6]

This gender difference in the likelihood of holding a tenure track job may not indicate that identical men and women are starting in different jobs, but instead may be picking up gender differences in background factors such as field, race and PhD quality. After all, we see in Table 2 that women are older at PhD receipt, come from later cohorts on average, are more likely to be black and to be citizens, and are less likely to be Asian and temporary residents. Also, fewer received their degrees from major research (R1) institutions, although the (noisy) NRC rankings of PhD institutions are not significantly different for men and women.

We therefore turn to our probit and hazard models of the longitudinal data to control for

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track jobs. We have no publication data for pre-PhD.

these factors. The first column of Table 3 shows the gender differences in obtaining a tenure-track job during the first six years post-PhD from a probit analysis controlling for background covariates. There is a highly significant 4.0 *percentage point* female disadvantage in the likelihood of obtaining a tenure track job six years after PhD receipt (which translates into women being 11% less likely than men to obtain the job). The fact that this gap is much smaller than the 10 percentage point average gender difference of Table 1 indicates that a great deal of the raw difference was due to different female and male background covariates.

The second and third column is based on a specification including an interaction term between female and PhD year, along with background characteristic controls, in order to test whether the sex differences in the likelihood of receiving a tenure-track job changed over the decades studied. For social science overall, the interaction term is not statistically significantly different from zero and the estimated sex difference in obtaining a tenure track job for 1981 PhDs and 1999 PhDs in social science as a whole is very small.

The rest of the rows in the top panel of Table 1 and of Table 3 divide this analysis by social-science field and indicate wide differences between fields. The gender differences in the average rates of tenure receipt in Table 1 are very large for economics and sociology – each with a gender difference that represents about 24% of the average likelihood of receiving a tenure track job (12.2 and 13.7 percentage points respectively) – and for clinical psychology, where the 4.2 percentage point gender difference represents a full 40% of the (low) average likelihood of entering a tenure-track job. The other fields have no significant female disadvantage, and in political science the point estimate even suggests that more women enter tenure-track jobs than men.

[6] Recall that these overall average rates may be somewhat higher than observed among all doctoral recipients because of those who received doctorates after 2000, only those who were observed in a tenure track job are included in this analysis.

These field-specific gender differences are hardly different controlling for background characteristics. Thus, in Table 2 (first column), economics and clinical psychology display only marginally smaller gender differences in the probability of entering tenure track jobs. In sociology, adding controls actually increased the estimated gender difference. The other fields continue to have small and insignificant gender differences of varying signs.

In the field-specific equations allowing the female impact to change over time, the only field with a significant interaction term is clinical psychology, where women are becoming *less* likely to enter tenure-track jobs. In 1981, women were slightly more likely than men to enter tenure track academia but in 1999, women were 9.6 percentage points less likely than men to enter tenure track.

Marriage and fertility decisions may be affecting women's tenure track employment differently than men's. To investigate this possibility, we included gender-specific variables for combinations of marital status and children in additional probit analysis and report key comparisons in the first column of Table 6. Specifically, we report on the impact of these family choices on women, and on comparisons between otherwise similar men and women by family composition. Because the comparison of single childless women and single childless men arguably might be most representative of the gender differences *not* due to women's greater family responsibilities, we have estimated these for the specific fields and included them in the last column of Table 3.

Single childless women are actually significantly *more* likely (7.9 percentage points P=.09) than childless single men to have a tenure track job within six years of PhD for social sciences as a whole. Again, this average conceals large differences across fields. Single women have a much *greater* likelihood than men to receive tenure-track jobs in political science (21.5 percentage points), economics (19.4 ppt.) and psychology (8.7 ppt.); in sociology, the point estimate suggests

that single women remain less likely than men to enter a tenure track job but insignificantly so. In the other fields, including clinical psychology, single men and single women are statistically indistinguishable. This sheds a different light on the large gender differences in economics, clinical psychology, and perhaps sociology, suggesting that the reasons were less likely to be observed in tenure track jobs in these fields was due to family choices of the women.

The first column of Table 6 gives more details on what family characteristics deter women from entering tenure-track jobs. Marriage itself does not significantly keep women from entering tenure track jobs. However, having a child anytime within those six years make women 11 percentage points less likely to enter a tenure track job, with the point estimate of the impact particularly large for those with pre-kindergarten aged children. Having only a child over the age of six during this period has less than half the impact of a younger child.

The rest of the rows of Table 4 compare married women to married men with similar-aged children. These tell a similar story, that married women with young children are much less likely than men with young children to enter tenure-track jobs. The female-male comparisons are somewhat larger than children's impact on women alone, because in social science academia -- as in the labor market more generally – marriage and children tend to occur to more successful men, which in this context means that married men with children are *more* likely than single men to get a tenure track job. In fact, in social science academia, the male marriage and child premia is relatively small on average relative to those seen in other less educated and homogeneous populations.

In the next section, we consider gender differences in tenure receipt.

V. Moving Up the Career Ladder: The Award of Tenure

Returning to Figure 2A, the dashed line shows the changing percentage female among

social science associate professors. The trend is increasing, most likely dominated by the increasing proportions of women among assistant professorships. This does not answer the question of whether women and men have similar likelihoods of receiving tenure. For this, we use the longitudinal aspect of the data set. We get a sense of the size of average gender differences tenure rates for those with PhDs 1981-2003 who had had a tenure track job (within 6 years of PhD) from Table 1. Tenure-track women in social science academia are on average 8.7 percentage points less likely than men to receive tenure within 11 years of PhD.

This gender difference does not control for PhD year, quality of PhD institution, age at PhD or race/citizenship variables. The first column of Table 4 summarizes the impact of gender on the probability of being promoted to tenure by 11 years from the doctorate controlling for these background variables, while the first column of the top panel of Table 7 presents the risk ratio, the ratio of female to male likelihood of being tenured each year from the hazard analysis controlling for these same variables. To allow us to compare the hazard rates to the averages and probit analyses, in our discussion here on tenure and promotion to full we convert probit results to the gender differences as a percentage of the male average.[7]

Gender differences in social science tenure rates controlling for background characteristics are somewhat lower than they were without controls. Women are 7.1 percentage points or 9.7% less likely than men to be tenured by 11 years post-doctorate in the probit analysis; in the hazard analysis, the estimated difference is similar: women are 11.1% less likely than men to receive tenure.

The top row of the next two columns of Table 4 and 7 indicate that this gender difference is disappearing over time for social science as a whole. The interaction between female and PhD year is significantly positive in both the probit and hazard analyses, leading to a large and

significant gender difference for the 1981 PhD cohort: 15.3 percentage points or 20% in the probit and similarly 20% in the hazard. By 1999 the gender difference in tenure had fallen to zero.

Can the gender differences in tenure receipt (averaged over the period) be explained by productivity differences and differences in the nature of the jobs? Comparing the specification with only background characteristics (column 1 of Tables 4 and 7) and the specification adds productivity covariates (the 5th column of these tables respectively), we see that adding controls for publications, employer quality, government support, and work activities lowers the average female tenure disadvantage to about 8% in the probit analysis (5.9 percentage points, down from 7.1) and in the hazard analysis.

Can gender differences in tenure receipt (again, averaged over the period) be explained by family situation? The first row of the fourth columns in Tables 4 and 7 show no significant difference between tenure receipt for single childless women and men, with varying signs, suggesting that, indeed, family was a major contributor to the average gender difference.[8]

Tables 6 and 8 give more details on family's impact. The first rows indicate that neither marriage nor children had any significant negative impact on women's tenure receipt. Indeed, having had only older children seem to have had a positive impact on women's tenure receipt by 11 years in the probit analysis. However, the comparisons of married women and men with children – particularly with young children – indicate large tenure penalties for women, which would be consistent with the other analysis only if men have a large positive marriage and child wage premium. For instance, women who had pre-K children in the first 11 years post-PhD were 10.4 percentage points or 14% percent less likely to get tenure than similar men according to the

[7] In other words, the tables on averages and probit give the gender differences in percentage points and therefore, we divide these by the average male level. For the hazard analysis we give 1 minus the female/male risk ratio.
[8] Recall that most family variables in both the probit and hazard analysis measure whether the person was observed in a family situation at any time during the 11 years since PhD, but that the "single and childless" equals 1 only if the person was single and childless throughout the 11 years since PhD.

probit and about 25% less likely according to the hazard analysis.

Having only older (>5 years) children does not hurt women attain tenure and instead seems to increase their tenure likelihoods. Combining this with the tenure track results in the previous section, we conclude that women who had their children before they received their PhDs were much less likely to have been on the tenure track (since they had pre-K kids in the first 6 years after PhD) but these children did not deter tenure receipt for those who did achieve a tenure track job.

As was true when explaining entrance into tenure-track academia, the fields within social sciences are different. Because of the importance of the tenure decision, we discuss each field in turn.

In ***economics***, with no controls the average difference in tenure rates of women and men within 11 years is 14.3 percentage points or almost 20% (Table 1). Adding background controls does not change the size of this tenure penalty (Table 4) in the probit analysis. In the hazard analysis (Table 7), women's disadvantage with background controls is equal in size to the disadvantage in the probit, but is not significant at conventional levels. We did not discern any changes over time in women's tenure disadvantage, as evidenced by an insignificant interaction term between female and PhD year. Controlling for our albeit limited productivity measures does little to change the gender difference, except to render it significant in the hazard analysis.

Limiting the analysis to single childless economists, in the economics probit analysis not only does the gender difference not disappear, but it actually doubles. However, the hazard analysis tells a different story, inasmuch as for single childless women, the female disadvantage does not change in size but remains. We thus have ambiguous results for economics. Gender differences in tenure receipt are large despite controls and are not limited for women who have children in the probit analysis only. They are insignificant in the hazard analysis.

Political science has the second largest raw difference in men's and women's tenure rates (12.5 percentage points or 16%). In political science, however, the size of this difference falls considerably and becomes insignificantly different from zero when background covariates are added (in both probit and hazard analysis). There are no significant time trends in the gender difference, although the sign suggests smaller differences for later cohorts. Differences between single childless men and women are also insignificant, although of opposite signs in the two analyses.

Psychology is the final field with a substantial and significant raw gender difference in tenure rates, 11.6 percentage points (16%). This gender difference remains equally large and significant when background controls are added, and has similar significance and size in the probit and hazard analyses. However, single childless women and men do not have significantly different tenure rates. How much of the gender difference is due to productivity differences depends on whether one looks at the probit analysis, where large and significant gender differences remain even with productivity controls, or at the hazard analysis, where the difference become insignificant. However, both methodologies agree that there has been significant equalization in tenure rates over time (i.e. the interaction term between female and PhD year is significantly positive), so much so that while the fitted female tenure penalty in 1981 was 26 percentage points or more than 35% (in both analyses), the fitted female penalty in 1999 had fallen to zero.

Finally, both ***sociology*** and ***other social sciences*** have no significant gender differences in tenure rates without controls and in all versions with controls in both the probit and hazard analyses.

We next evaluate whether we see the same patterns in promotion to full professor.

VI. Making it to the Top: Promotion to Full Professorship

Returning to Figure 2A, among full professors in social science, the percentage female has been steadily increasing over the quarter century but by 2006 still had not yet achieved the level of female representation that had been achieved in assistant professorships in the early 1980's, or the level of female representation that had been achieved in PhDs in 1976. Economics is the most extreme, with only 11 percent of full professors being female in 2010. Is this due to earlier career stages, where women did not take tenure track jobs or did not receive tenure? Or are women less likely to be promoted to full? The evidence on this is presented in this section, with the caveat that the size of the sample used in the analysis of promotion to full is considerably smaller than the samples for the earlier stages, and standard errors rise accordingly.

As Table 1 shows, on average 45% of faculty who had been tenured within 11 years of their PhD are promoted to full professors within 7 years of having received tenure. Women are about 12.6 percentage points, which translates to 25%, less likely than men to receive full professorships by 7 years post-tenure (Table 1). This difference is hardly ameliorated by adding background controls or even by also adding productivity controls (Tables 5 and 7), falling in the probit only to 9.6 percentage points or 20% and falling less in the hazard. The time trend in the gender difference in promotion to full is insignificant.

These differences do not remain for single, childless men and women. The probit and hazard analysis agree that single, childless are not significantly different in their promotion to full *ceteris paribus.* There are, however, not many single childless men in this older sample, making this comparison less accurate and hence indicative.

Are these differences due to family responsibilities? Marriage alone increases the likelihood that a woman gets promoted to full (Tables 6 and 8). Children's impact on women's promotion to full is not significantly different than zero, although there is some suggestion that

young children do deter it (p=.15 in both analyses). However, there remains a large promotion disadvantage for married women with children compared to married men with children. Again, note that the childbirth and hence young children are less likely to occur during the period once is working towards full professorships.

The different fields are not uniform in their gender differences in promotion to full. ***Economics*** remains the field with the largest raw gender differences, but the two other fields that indicate large differences at this career stage are sociology and other social sciences.

Economics has the highest average likelihood of promotion to full within 7 years of tenure, and the largest unadjusted female penalty difference, measuring 26.6 percentage points and making women less than half as likely as men to be promoted to full within 7 years of tenure receipt. Adding in background characteristics and productivity variables as controls does little to change the magnitude or significance of this difference (Tables 5 and 7). There is no significant time trend in the gender differences. We note that comparison of single childless women and men is particularly inaccurate in these field-specific analyses of full promotion since there are even fewer numbers who fall in this category. In economics, there are only 9 men and 14 women.

Sociology had not shown significant gender differences at the tenure decision, but women have significantly lower likelihoods of being promoted to full professors in terms of raw averages (a 16.6 percentage point or 35% difference). Again, the magnitude of the impact is not diminished when background is controlled for, but the significance in the probit (only) falls, to p=.106. The gender difference does not significantly change over cohorts.

Other social sciences, encompassing mostly anthropology and linguistics, also had not demonstrated significant gender differences at previous career stages but seem to indicate some differences in promotion to full. The raw magnitude is large, 16.5 percentage points or 33% of the male rate. Adding background characteristics and even productivity characteristics do not

noticeably decrease the size of the effect in the probit, and in the hazard the female advantages are even larger. The interaction term between female and PhD year, while not significant, has the lowest p-value of all fields in the full analysis (P=.16 in hazard, .22 in probit) and indicates there may have been improvement over time.

While there were gender differences in tenure receipt within ***psychology***, there are none at the promotion to full stage. Probit coefficients are small and hazard risk rates are close to 1. There is also little clear evidence of gender differences in ***political science***. While several of the point estimates suggest gender differences to be concerned about, most gender differences are not significant. The single exception is that with background and productivity controls, women are significantly less likely than men to be promoted to full in the probit analysis, but not in the hazard analysis.

VII. Discussion and Conclusion: Progress, Pitfalls or Plateaus?

This chapter has measured gender differences in academic social science. NSF reports (NSF 2004b and Long et. al. 2001) using the same data set considered gender differences in academic careers in all sciences, including social sciences. By separating out the natural sciences and engineering (S&E) in our previous work (Ginther and Kahn 2009) from the social sciences here, we have identified gender differences in promotion that existed in social science but not in S&E. We have found that over the period studied, there are appreciable gender differences in the probability of obtaining a tenure track job, small differences in receiving tenure, and large gaps in promotion to full professor in social science as a whole. Despite the progress women have made in obtaining doctorates, they are less likely to take tenure track jobs and those who achieve tenure often plateau at the associate professor rank. We find that some of these gender differences have fallen over time, that some reflect gender differences in education, ability and productivity, and

that some relate to family-choices made in a world where women continue to be the main child-rearer. The differences that persist for social science as a whole that are not explained by education, ability, productivity or family choices are at the level of promotion to full professorship. Finally, disaggregated by field, as was true in our work on earlier cohorts (Ginther and Kahn 2004), economics remains the outlier with the greatest gender differences in promotion: a 20 percent gender gap in achieving tenure and a 50 percent gap in promotion to full.

To be more specific, at the entry stage, there are raw gender differences in whether female and male social science PhDs enter academic tenure track jobs, although these mostly reflect different background characteristics. Moreover, as we found in our previous work in science (Ginther and Kahn 2009), for social science overall women seem to be facing a choice between children and an academic careers, insofar as single childless women are in fact more likely than single childless men to enter a tenure track job. Breaking this down by social science field, the lower likelihood of women to get tenure track jobs is completely due to economics, sociology and clinical psychology. In clinical psychology, women are increasingly choosing clinical rather than academic careers. In economics and sociology, the large raw gender difference is not attributable to differing background and education, yet only occurs for women who have children. This too suggests that supply factors and personal choices are dominating entry into tenure track jobs.

The similarities between science and social science employment outcomes diverge at the stages of promotion to tenure. Ginther and Kahn (2009) show no gender differences in promotion to tenure -- or full professor -- for all science and engineering (S&E) fields combined. In the social sciences, moderate gender differences in tenure rates, on the order of 8%, remain even after controlling for background characteristics. However, these gender differences have fallen and indeed disappeared over time. Moreover, there are no average gender differences in tenure receipt over the period for childless singles.

Within individual fields, we found that for one of the fields with large raw gender differences in tenure receipt – political science – the differences are simply reflecting different background characteristics (such as PhD quality) while for a second field with large raw gender differences – psychology – the differences have disappeared over time. Economics is the one field where gender differences in tenure receipt seem to remain even after background and productivity controls are factored in and even for single childless women. There is ambiguity in this finding, however, because gender differences are not statistically significant in the hazard analysis.

At the top echelon, promotion to full professorships, we find persisting significant gender differences for social science as a whole and for the fields of economics, sociology and anthropology/linguistics, even after controlling for background and productivity. The gender full professor gap in social science as a whole ranges between 20 to 25 percent depending on what is controlled for and what methodology (probit, hazard) is used. Economics is again worse than all social science disciplines, where women are half as likely as men to be promoted to full professor. It is striking that the full professor promotion gaps are not readily explained by covariates including productivity measures and family characteristics. When productivity is included in the analysis, the gender promotion gap barely changes.

Dual career problems do not seem to deter women from getting a tenure track job, from getting tenure, or from becoming a full professor. The presence of children, however, does disadvantage women in some ways. First, children and particularly pre-kindergarten children lower women's likelihood of taking a tenure track job. Second, married women with young children are less likely to be promoted to being tenured or to full professorships than are married men with children. The interpretation of these promotion comparisons, however, is not obvious because we do *not* find that women with young children are less likely to be promoted than women without children. In fact, the story most consistent with these findings is that men are

advantaged in promotion by being married and having young children. In the labor literature, there are competing explanations in why married men with children do better in general labor markets. While married men with children may feel more responsibility to their families and therefore work harder, a productivity story, another possibility is that more able men tend to get married and have children, a selection story.[9] For the highly educated men in academia, the selection story seems more applicable than the productivity story.

Similarly, the opposite selection story can be made about women: the women most committed to academic careers may choose not to have children, although would be more devoted to their careers and successful even if they did have children. We cannot know, therefore, whether the measured impact of younger children on promotion (or even on entry to academic careers) is completely selection, or whether women are being hampered by children's presence.

As economists, we remain troubled by the large, unexplained gender differences in promotion to tenure and full professor in our field. Admittedly, our controls for academic productivity are measured with error and access to better data might explain these large differences. Nevertheless, the results indicate that professional development efforts such as the Committee on the Status of Women in the Economic Profession's CEMENT mentoring workshops remain necessary. Participants in the mentoring program are randomly assigned to the mentoring treatment. An interim assessment of CEMENT shows that it increases the number of publications, publications in top journals and federal grants for participants (Blau, Currie, Croson and Ginther 2010). To the extent that promotion differences are being driven by productivity differences, efforts like CEMENT will help to narrow the gender promotion gap in economics.

[9]Much of the literature supports the selection hypothesis (e.g. Petersen *et al* 2011, Rodgers and Stratton 2010) but one paper on identical twins finds the opposite (Antonovics and Town 2004).

References

Allison, Paul D. 1995. *Survival Analysis Using the SAS System*. Cary, NC: The SAS Institute, Inc.

Antonovics, Kate; and Robert Town. (2004) "Are All the Good Men Married? Uncovering the Sources of the Marital Wage Premium.) *American Economic Review*. 94(2): 317-21.

Bellas, Marcia and Robert K. Toutkoushian. (1999). "Faculty Time Allocations and Research Productivity: Gender, Race and Family Effects." *Review of Higher Education* 22(4): 367-390.

Blau, Francine D., Janet M. Currie, Rachel T.A. Croson and Donna K. Ginther. (2010). "Can Mentoring Help Female Assistant Professors? Interim Results from a Randomized Trial. (2010) *American Economic Review Papers and Proceedings.* 100(2): 348-352.

Brown, Prudence, Dan Pasquini, and Susan Mitchell. 1997. "Methodological Report 1991 Survey of Doctorate Recipients." Mimeo, National Research Council, Washington, DC.

Congressional Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology (CAWMSET). 2000. "Land of Plenty."

Fox, Mary Frank. (2005). "Gender, Family Characteristics and Publication Productivity among Scientists." *Social Studies of Science*. 35(1): 131-150.

Goldberg, Carey. 1999. "MIT Acknowledges Bias Against Female Professors." *The New York Times*. (March 23, 1999): p.1.

Ginther, Donna K. 2001. "Does Science Discriminate Against Women? Evidence From Academia 1973-1997" Federal Reserve Bank of Atlanta Working Paper 2001-02, February 2001.

Ginther, Donna K. 2002. "Gender Differences in Employment Outcomes for Academics in the Social Sciences." Mimeo, University of Kansas.

Ginther, Donna K. 2003. "Is MIT the Exception? Gender Pay Differentials in Academic Science." *Bulletin of Science, Technology, and Society* 23:1, 21-26.

Ginther, Donna K. 2004. "Why Women Earn Less: Economic Explanations for the Gender Salary Gap in Science" *AWIS Magazine* (Winter 2004) 33:1, 6-10.

Ginther, Donna K. 2006a. Economics of Gendered Distribution of Resources in Academia. In *Biological, Social, and Organizational Components of Success for Women in Science and Engineering: Workshop Report*. Washington, DC: Committee on Maximizing the Potential of Women in Academic Science and Engineering,The National Academies Press. 56-60.

Ginther, Donna K. 2006b. The Economics of Gender Differences in Employment Outcomes in Academia. In *Biological, Social, and Organizational Components of Success for Women in Science and Engineering: Workshop Report*. Washington, DC: Committee on Maximizing

the Potential of Women in Academic Science and Engineering, The National Academies Press. 99-112.

Ginther, Donna K. and Kathy J. Hayes. 1999. "Salary and Promotion Differentials by Gender for Faculty in the Humanities." *American Economic Review Papers and Proceedings* 89(2): 397-402.

Ginther, Donna K. and Kathy J. Hayes. 2003. "Gender Differences in Salary and Promotion for Faculty in the Humanities,1977-1995." *The Journal of Human Resources,* 38:1, 34-73.

Ginther, Donna K. and Shulamit Kahn. 2004. "Women in Economics: Moving Up or Falling Off the Academic Career Ladder?" *Journal of Economic Perspectives* (Summer 2004) 18:3, 193-214.

Ginther, Donna K. and Shulamit Kahn. 2009. Does Science Promote Women? Evidence from Academia 1973-2001. In *Science and Engineering Careers in the United States* eds. Richard B. Freeman and Daniel F. Goroff. Chicago, IL: University of Chicago Press for NBER.

Government Accountability Office (GAO) 2004. "Women's Participation in the Sciences Has Increased, but Agencies Need to Do More to Ensure Compliance with Title IX." Washington DC: GAO. Available on-line at http://www.gao.gov/cgi-bin/getrpt?-GAO-04-639.

Kahn, Shulamit. 1993. "Gender Differences in Academic Career Paths of Economists." *American Economic Review Papers and Proceedings* 93: 52-56.

----------. 1997. "Women in the Economics Profession." *Journal of Economic Perspectives* 9(4): 193-205.

Levin, Sharon G. and Paula E. Stephan. 1998. "Gender Differences in the Rewards to Publishing in Academe: Science in the 1970s." *Sex Roles* 38(11/12): 1049-1064.

Long, J. Scott, Paul D.Allison and Robert McGinnis. 1993. "Rank Advancement in Academic Careers: Sex Differences and the Effects of Productivity." *American Sociological Review* 58(5): 703-722.

Long, J. Scott (ed.) 2001. *From Scarcity to Visibility.* Washington, DC: National Academy Press.

Massachusetts Institute of Technology Faculty Newsletter. 1999. March, 1999: 21(4) available on-line at http://web.mit.edu/fnl/women/women.html.

Mitchell, Susan B., Ramal Moonesinghe and Brenda G. Cox. 1998. "Using the Survey of Doctorate Recipients in Time-Series Analyses: 1989-1997." Mimeo, National Science Foundation, Washington, DC.

Morrison, Emory, Elizabeth Rudd and Maresi Nerad (2011). "Onto, Up, Off the Academic Faculty Ladder: The Gendered Effects of Family on Career Transitions for a Cohort of Social Science Ph.D.s." *The Review of Higher Education*. 34(4): 525-553.

National Academies of Science (2006). *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.* Washington, DC: Committee on Maximizing the Potential of Women in Academic Science and Engineering, The National Academies Press. 56-60.

National Academies of Science (2011). *Gender Differences at Critical Transitions in the Careers of Science, Engineering, and Mathematics Faculty.* Washington, DC: Committee on Gender Differences in Careers of Science, Engineering, and Mathematics Faculty, Committee on Women in Science, Engineering, and Medicine [of] Policy and Global Affairs [and] Committee on National Statistics, Division of Behavioral and Social Sciences and Education, the National Research Council of the National Academies, The National Academies Press.

National Science Foundation, Division of Science Resources Statistics. 2011. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2011*. Special Report NSF 11-309. Arlington, VA. Available at http://www.nsf.gov/statistics/wmpd/.

National Science Foundation (NSF). 2004b. *Gender Differences in the Careers of Academic Scientists and Engineers*, NSF 04-323, Project Officer, Alan I. Rapoport (Arlington, VA, 2004).

Nelson, Donna J. and Diana C. Rogers. (2005). "A National Analysis of Diversity in Science and Engineering Faculties at Research Universities." " Norman, OK. January, 2005. Available on-line at http://cheminfo.chem.ou.edu/~djn/diversity/briefings/Diversity% 20Report% 20Final.pdf.

Petersen, Trond, Andrew Penner M. and Geir Hogsnes. (2011) "The Male Marital Wage Premium: Sorting vs. Differential Pay." *Industrial and Labor Relations Review.* 64(2): 283-304.

Preston, Anne E. 1994. "Why Have All the Women Gone? A Study of Exit from the Science and Engineering Professions." *American Economic Review* 84(5): 1446-1462.

Preston, Anne E. Leaving *Science: Occupational Exit from Scientific Careers.* Russell Sage Foundation: New York, 2004.

Rodgers, William M. and Leslie S. **Stratton**, Leslie S. (2010) "Male Marital Wage Differentials: Training, Personal Characteristics, and Fixed Effects." *Economic Inquiry*. 48(3)722-42

Rosser, S. V. (2004). *The Science Glass Ceiling* New York: Routledge.

Rudd, Elizabeth, Emory Morrison, Joseph Picciano and Maresi Nerad (2008). "Finally Equal Footing for Women in Social Science Careers?" *CIRGE Spotlight on Doctoral Education #1*. CIRGE: University of Washington, Seattle, WA. www.cirge.washington.edu.

Sax, Linda J., Linda Serra Hagedorn, Maisol Arredondo and Frank A. Dicrisi III (2002). "Faculty Research Productivity: Exploring the Role of Gender and Family-Related Factors." *Research in Higher Education* 43(4): 423-446.

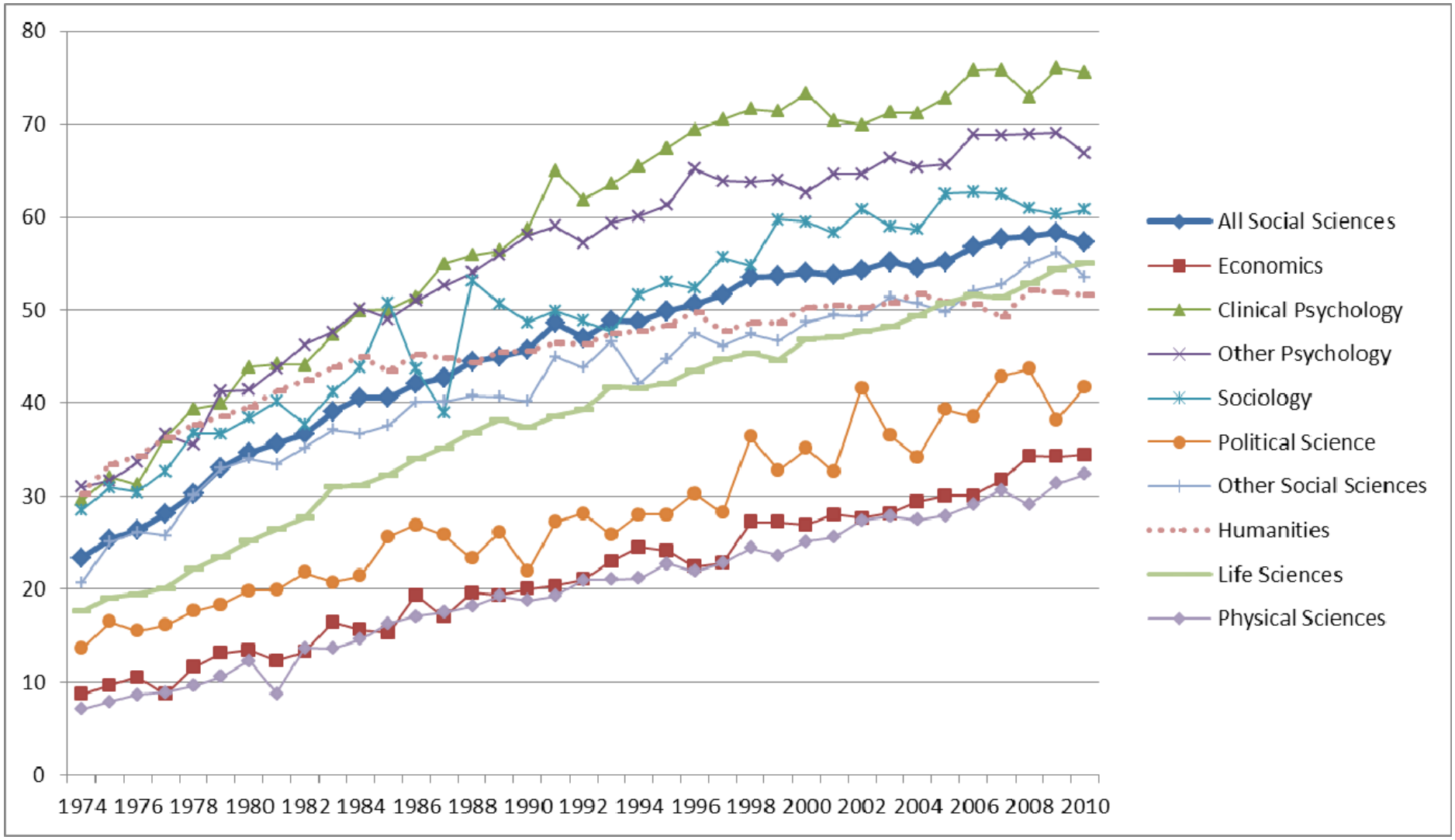
Stack, Steven. (2004). "Gender, Children, and Research Productivity." *Research in Higher Education*. 45(8): 891-920.

Wolfinger, Nicholas H., Mary Ann Mason, and Marc Goulden. 2008. Problems in the pipeline: Gender, marriage and fertility in the ivory tower." Journal of Higher Education 79(4): 389-405.

Xie, Yu and Kimberlee A. Shauman. 1998. "Sex Differences in Research Productivity: New Evidence about an Old Puzzle." *American Sociological Review* 63(6): 847-870.

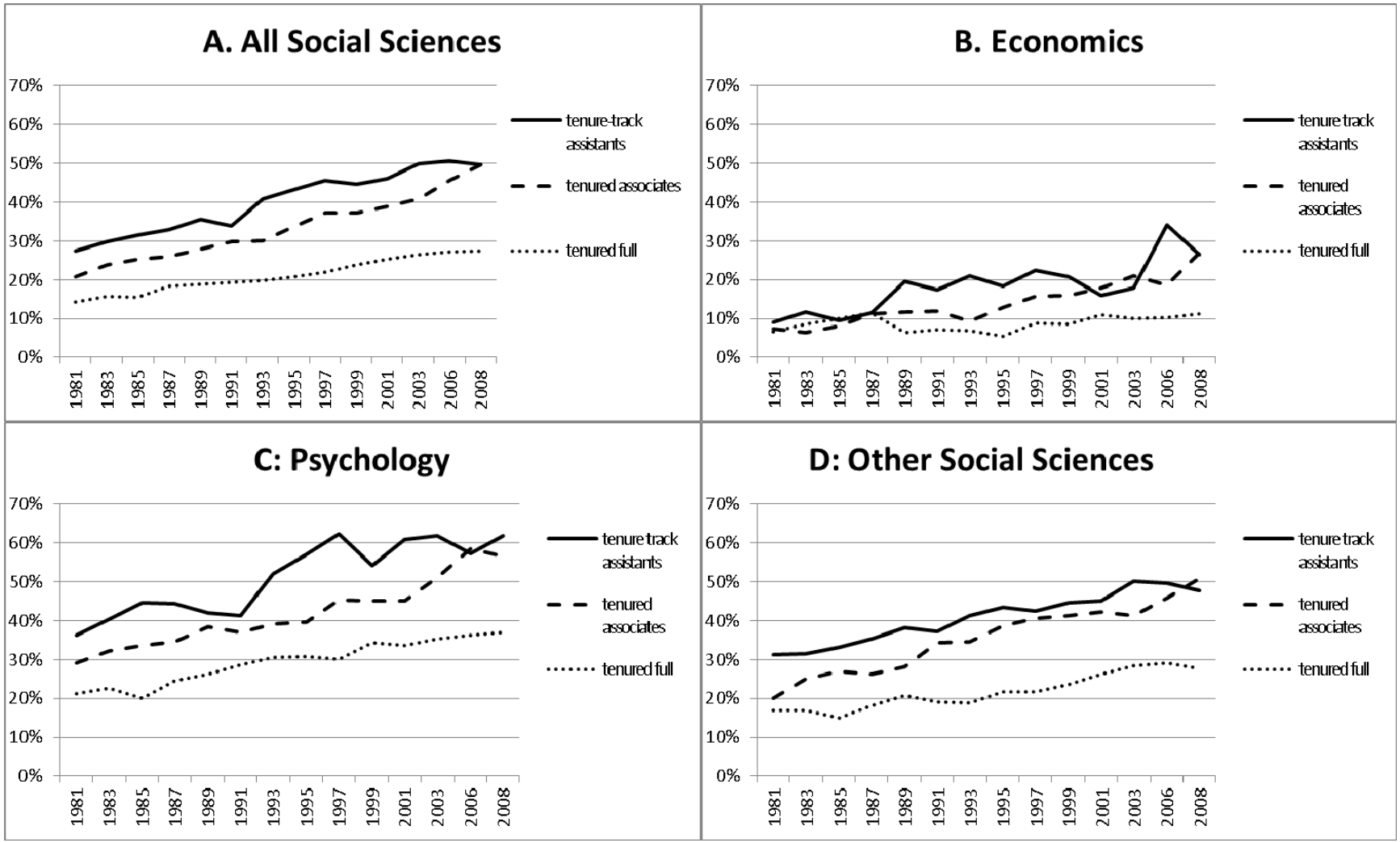
Xie, Yu and Kimberlee A. Shauman. Women in Science: Career Processes and Outcomes. Cambridge MA: Harvard University Press, 2003.

Figure 1: Percentage of Doctorates Awarded to Females



Source: Survey of Earned Doctorates 1980-2011

Figure 2: Percentage Female By Academic Rank



Source: Survey of Doctorate Recipients 1981-2008

Table 1: Weighted Means of Dependent Variables

	Total	Female	Male	# Obs
The Proportion of Doctorates on Tenure Track within 6 years of Ph.D.*				
All	**0.320**	**0.271**	**0.369**	7,707
Economics	**0.491**	**0.398**	**0.520**	892
Clinical Psychology	**0.106**	**0.089**	**0.131**	1,548
Psychology	0.243	0.235	0.254	2,496
Sociology	**0.566**	**0.500**	**0.637**	733
Political Science	0.516	0.523	0.513	755
Other Social Sciences	0.384	0.376	0.392	1,283
The Proportion of Tenure Track Professors who are Promoted to Tenure within 11 years of Ph.D.**				
All	**0.699**	**0.646**	**0.733**	1,906
Economics	***0.706***	***0.588***	***0.731***	336
Psychology	**0.636**	**0.581**	**0.697**	586
Sociology	0.763	0.748	0.774	306
Political Science	***0.733***	***0.646***	***0.771***	284
Other Social Sciences	0.722	0.731	0.715	394
The Proportion of Tenured Professors who are Promoted to Full Professor within 7 years of Tenure Receipt***				
All	**0.454**	**0.370**	**0.496**	1,130
Economics	***0.527***	***0.294***	***0.560***	210
Psychology (incl Clinical)	0.439	0.434	0.444	308
Sociology	***0.410***	***0.309***	***0.475***	193
Political Science	0.456	0.378	0.481	177
Other Social Sciences	**0.425**	**0.336**	**0.501**	242

Bold: gender difference significant at 1% level; ***Bold Italics:*** at 5% level; Underline: at 10% level

* Sample limited to 1981 to 2003 PhDs

** Sample limited to those who received a tenure track job within 6 years of Ph.D., 1981 to 1998 PhDs

*** Sample limited to those who received tenure within 11 years of Ph.D., 1979 to 1995 PhDs

Table 2: Gender Differences in Mean Characteristics of Probit Analyses(weighted)

	population:	All Doctorates (in Tenure Track Probit Analysis)*		All Tenure-Track within 6 years (for Tenure probit analysis)**		All Tenured within 11 years (for Full probit analysis)***	
Variables:		**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
	Percent of Total Population	0.498	0.502	0.395	0.605	0.331	0.618
Background	Age at Ph.D.	**35.473**	**34.435**	**34.039**	**33.031**	**34.531**	**32.39**
	White	0.836	0.837	0.817	0.807	0.857	0.845
	African, Native American, Mixed	***0.060***	***0.048***	***0.078***	***0.051***	0.057	0.051
	Asian	**0.060**	**0.077**	**0.062**	**0.100**	0.049	0.072
	Hispanic	0.042	0.035	0.042	0.043	0.037	0.032
	Citizen	**0.933**	**0.878**	**0.916**	**0.829**	**0.936**	**0.883**
	Temporary Residence Visa	**0.030**	**0.048**	*0.039*	0.057	0.031	0.044
	Year of Ph.D.	**1992.6**	**1990.8**	**1989.8**	**1988.5**	**1987.0**	**1985.3**
	Ph.D. from Research I	**0.588**	**0.618**	0.727	0.719	0.757	0.720
	Ph.D. from Research II	0.140	0.139	0.126	0.146	***0.108***	***0.159***
	Ph.D. from Doctorate I	0.142	0.143	*0.081*	*0.105*	0.082	0.096
	Ph.D. from Doctorate II	0.047	0.049	0.033	0.025	*0.033*	*0.017*
	Ph.D. department NRC rating	2.95	2.97	3.203	3.196	3.237	3.151
Family	Single No Children	**0.226**	**0.181**	0.214	0.113	**0.211**	**0.091**
	Married	**0.745**	**0.812**	**0.744**	**0.884**	**0.745**	**0.891**
	Children	**0.465**	**0.561**	**0.533**	**0.695**	**0.519**	**0.749**
	Children <6	**0.349**	**0.449**	**0.421**	**0.575**	**0.348**	**0.534**
	Only older children	0.116	0.112	0.112	0.120	*0.172*	*0.214*
Employer/	% years Research I employer			8.08	7.72	8.14	8.02
Productivity	% years Research II employer			1.90	1.84	2.17	2.45
	% years Liberal Arts I employer			1.96	1.91	2.46	2.97
	% years with Government Support			5.57	5.53	6.36	6.72
	Avg. Bi-annual Refereed Publications			**0.293**	**0.404**	0.466	0.535
	% years Research Prim.or Second Activity			***19.20***	***19.75***	***19.16***	***20.91***
	% years Teaching Primary Activity			**15.90**	**14.95**	20.03	18.70

Bold: gender difference significant at 1% level; ***Bold Italics:*** at 5% level; Underline: at 10% level

* Sample limited to 1981 to 2003 PhDs

** Sample limited to those who received a tenure track job within 6 years of Ph.D., 1981 to 1998 PhDs

*** Sample limited to those who received tenure within 11 years of Ph.D., 1979 to 1995 PhDs

Table 3: Percentage point Impact of Being Female on the Probability of Being in a Tenure Track Job

(from Probit Analysis)

	background covariates	background covariates with female*PhD		background & family covariates: single childless female v. similar male
		female w. 1981 PhD	female w. 1999 PhD	
ALL	**-4.03**	-4.02	-3.7	**7.93**
	(1.27)	(2.20)	(1.64)	**(3.12)**
Economics	**-11.83**	-12.46	-10.87	***19.43***
	(4.13)	(7.98)	(5.78)	***(9.07)***
Clinical Psychology	***-4.21***	2.04	**-9.62**	-2.6
	(1.70)	(3.27)	**(2.63)**	3.13
Psychology* **	-1.64	1.28	-3.62	***8.73***
	(1.96)	(3.57)	(2.79)	***(4.09)***
Sociology	**-15.28**	***-16.5***	***-12.66***	-8.76
	(4.59)	***(7.98)***	***(6.08)***	(9.69)
Political Science	1.50	-7.05	5.65	***21.50***
	(4.42)	(9.09)	(5.28)	***(8.89)***
Other Social Sciences	-0.46	2.44	-2.09	-2.73
	(3.27)	(6.04)	(4.18)	(6.93)

Robust standard errors in parentheses. Bold: significant at the 1% level; ***Bold Italics:*** the 5% level; Underline: the 10% level

Sample limited to 1981 to 2003 PhDs

Table 4: Impact of Being Female on the Probability of Receiving Tenure within 11 years of Ph.D (from Probit Analysis)

	background covariates	background covariates with		background & family covariates: single childless female v. similar male	background & productivity covariates
		female w. 1981 PhD	female w. 1999 PhD		
ALL	**-7.13**	**-15.33**	0.33	-4.60	***-5.94***
	(2.53)	**(5.11)**	(4.55)	(6.40)	***(2.58)***
Economics	***-14.41***	-13.00	-15.92	***-33.89***	***-12.21***
	(5.74)	(13.09)	(12.85)	***(15.79)***	***(5.93)***
Psychology (incl. Clinical)	***-11.14***	**-26.23**	3.77	-3.82	***-9.65***
	(4.47)	**(8.86)**	(8.48)	(11.41)	***(4.34)***
Sociology	-0.62	-13.83	11.90	7.29	3.76
	(5.82)	(11.45)	(10.58)	(11.62)	(5.54)
Political Science	-7.07	-11.80	-3.60	-16.51	-7.88
	(5.53)	(12.71)	(9.56)	(12.65)	(5.32)
Other Social Sciences	1.39	0.44	2.17	8.15	2.17
	(5.38)	(12.33)	(9.40)	(1.30)	(5.24)

Robust standard errors in parentheses. Bold: significant at the 1% level; ***Bold Italics: the*** 5% level; Underline*: the* 10% level

Sample limited to those who received a tenure track job within 6 years of Ph.D., 1981 to 1998 PhDs

Table 5: Impact of Being Female on the Probability of Achieving Full Professorship within 7 years of tenure receipt (from Probit Analysis)

	background covariates	background covariates with		background & family covariates: single childless female v. similar male	background & productivity covariates
		female w. 1981 PhD	female w. 1999 PhD		
ALL	**-11.08**	**-14.46**	-3.21	-5.72	***-9.56***
	(3.48)	**(4.93)**	(8.92)	(9.16)	***(3.42)***
Economics	**-24.93**	***-29.27***	-16.54	19.38	***-23.03***
	(9.26)	***(12.69)***	(24.21)	(18.55)	***(9.47)***
Psychology (incl. Clinical)	-3.04	-4.05	-0.27	7.89	-0.55
	(6.05)	(8.25)	(16.78)	(14.88)	(5.80)
Sociology	***-16.55***	-9.00	-36.97	***-44.77***	-13.41
	(8.34)	(12.19)	(21.55)	***(17.45)***	(8.30)
Political Science	-5.88	-16.60	15.54	-22.82	-8.99
	(9.01)	(13.93)	(20.91)	(19.84)	(8.65)
Other Social Sciences	***-15.08***	**-27.07**	10.16	-19.17	-13.37
	(6.95)	**(9.87)**	(17.63)	(17.81)	(7.02)

Robust standard errors in parentheses. Bold: significant at the 1% level; ***Bold Italics:*** at the 5% level; Underline: at the 10% level

Sample limited to those who received tenure within 11 years of Ph.D., 1979 to 1995 PhDs

Table 6: Probit Analysis - Gender Differences by Family Situation

	Receive Tenure Track Job within 6 years of Ph.D.	Receive Tenure within 11 years of Ph.D.**	Receive Full within 7 years of tenure receipt***
Effect of marriage on childless woman	-3.22	7.75	***14.96***
	(2.27)	(5.04)	***(7.58)***
Effect of child on woman	**-10.36**	4.51	-8.40
	(1.55)	(3.40)	(5.37)
Effect of young child on woman	**-11.47**	1.50	-9.22
	(1.62)	(3.67)	(6.20)
Effect of only older child on woman	***-6.23***	**15.87**	-6.11
	(2.53)	**(5.68)**	(7.15)
Single woman v. single man	**7.93**	-4.60	-5.72
	(3.12)	(6.40)	(9.16)
Married woman w. child v. similar man	**-11.19**	***-7.67***	**-16.43**
	(1.61)	***(3.21)***	**(4.60)**
Married woman w. young child v. similar man	**-12.42**	**-10.42**	**-19.19**
	(1.71)	**(3.50)**	**(5.53)**
Married woman w. only older child v. similar man	-5.21	7.59	-10.31
	(3.74)	(8.15)	(8.36)

Robust standard errors in parentheses. Bold: significant at the 1% level; ***Bold Italics:*** at the 5% level; Underline: at the 10% level

** Sample limited to those who received a tenure track job within 6 years of Ph.D., 1981 and later PhDs

*** Sample limited to those who received tenure within 11 years of Ph.D., 1979 PhDs and later

Equations include background covariates and family variables.

Table 7: Differences in the Risk Ratio (Female / Male) from Hazard of Promotion

		background covariates	background covariates with female*PhD		background & family covariates: single childless female v. similar male	background & productivity covariates	People / Observations
			female w. 1981 PhD	female w. 1999 PhD			
Promotion to Tenure**							
	ALL	***0.889***	***0.795***	0.965	1.181	0.915	3,384/10,396
		(0.047)	***(.087)***	(.080)	(.182)	(.047)	
	Economics	0.788	1.120	0.617	0.768	0.805	581/1,790
		(0.113)	(.292)	(.174)	(.275)	(.104)	
	Psychology (incl. Clinical)	***0.823***	**0.561**	1.111	1.203	0.836	1,017/3,317
		(.079)	**(.106)**	(.178)	(.336)	(.077)	
	Sociology	0.927	0.679	1.152	1.005	0.973	553/1,687
		(.119)	(.182)	(.218)	(.340)	(.122)	
	Political Science	0.865	1.112	0.747	1.636	0.834	525/1,522
		(0.124)	(.366)	(.156)	(.602)	(.114)	
	Other Social Sciences	1.063	1.209	0.970	1.085	1.114	708/2,080
		(.124)	(.324)	(.166)	(.401)	(.126)	
Promotion to Full (since tenure receipt)***							
	ALL	**0.743**	**0.706**	0.828	0.742	**0.752**	1,936/6,324
		(.056)	**(.075)**	(.134)	(0.192)	**(.056)**	
	Economics	***0.557***	***0.497***	0.709	1.368	***0.572***	318/1083
		(.138)	***(.164)***	(.328)	(.843)	***(.147)***	
	Psychology (incl. Clinical)	0.939	0.943	0.929	0.813	0.944	562/1,806
		(.126)	(.173)	(.280)	(.339)	(.125)	
	Sociology	***0.686***	0.674	0.720	0.520	***0.677***	334/1,104
		(.126)	(.171)	(.282)	(.358)	***(.129)***	
	Political Science	0.761	0.648	0.998	0.581	0.733	310/1,008
		(.146)	(.204)	(.417)	(.304)	(.134)	
	Other Social Sciences	**0.566**	**0.451**	0.900	0.487	**0.567**	412/1,323
		(0.097)	**(0.110)**	(0.325)	(0.268)	**(0.096)**	

Robust standard errors in parentheses. **Bold:** significant at the 1% level; ***Bold Italics:*** at the 5% level; Underline: at the 10% level

** Sample limited to those who received a tenure track job within 6 years of Ph.D., 1981 and later PhDs

*** Sample limited to those who received tenure within 11 years of Ph.D., 1979 and later

Table 8: Hazard Analysis - Gender Differences by Family Situation

Difference in Female / Male Risk Ratio	Promotion to Tenure (time since PhD)**	Promotion to Full (time since tenured)***
Effect of marriage on childless woman	1.200	1.466
	(.149)	(0.314)
Effect of child on woman*	0.945	0.843
	(.076)	(0.126)
Effect of young child on woman*	0.878	0.781
	(.076)	(0.136)
Effect of only older child on woman*	1.242	0.983
	(.147)	(0.200)
Single woman v. single man	1.181	0.742
	(.182)	(0.192)
Married woman w. children v. similar man	**0.787**	**0.632**
	(.056)	**(0.081)**
Married woman w. young child v. similar man	**0.737**	**0.570**
	(.058)	**(.087)**
Married woman w. only older child v. similar man	1.139	0.78
	(.192)	(.185)

Standard errors in parentheses. **Bold:** significant at the 1% level; ***Bold Italics:*** at the 5% level; Underline: at the 10% level

** Sample limited to those who received a tenure track job within 6 years of Ph.D., 1981 and later PhDs

*** Sample limited to those who received tenure within 11 years of Ph.D., 1979 PhDs and later

Equations include background covariates and family variables.