

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

**Donna K. Ginther**

Associate Professor  
Department of Economics  
University of Kansas  
Lawrence, KS 66045  
Email: [dginther@ku.edu](mailto:dginther@ku.edu)

and

**Shulamit Kahn**

Associate Professor  
Department of Finance and Economics  
School of Management  
Boston University  
Email: [skahn@bu.edu](mailto:skahn@bu.edu)

June 22, 2006

## **Abstract:**

Many studies have shown that women are under-represented in tenured ranks in the sciences. We evaluate whether gender differences in the likelihood of obtaining a tenure track job, promotion to tenure, and promotion to full professor explain these facts using the 1973-2001 Survey of Doctorate Recipients. We find that women are less likely to take tenure track positions in science, but the gender gap is entirely explained by fertility decisions. We find that in science overall, there is no gender difference in promotion to tenure or full professor after controlling for demographic, family, employer and productivity covariates and that in many cases, there is no gender difference in promotion to tenure or full professor even without controlling for covariates. However, family characteristics have different impacts on women's and men's promotion probabilities.

**JEL Codes:** J4, J71

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

**Acknowledgements:** We also thank the National Science Foundation for granting a site license to use the data and Kelly Kang of the NSF for providing technical documentation. Serena Huang provided research assistance. Ginther acknowledges financial support from NSF grant SES-0353703. The use of NSF data does not imply NSF endorsement of the research, research methods, or conclusions contained in this report. Any errors are our own responsibility.

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

Academic careers consist of a series of milestones, the doctorate, tenure track employment, and promotion through the ranks to tenured professorships. Fewer women are present in the higher levels of academe – such as tenured jobs and full professorships at major research universities -- even in disciplines that have achieved parity in terms of doctorates awarded such as the social sciences and the humanities. 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 paper begins from the point when social scientists receive their Ph.D.s 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. We find that despite progress in obtaining tenure track appointments, women's careers in the social sciences are marked by pitfalls and plateaus in terms of promotion to tenure and full professor.

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 science disciplines (Long et al. 2001, Xie and Shaumann 2003). 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 2004a), women continue to be less likely than their male colleagues to be full professors and more likely to be assistant professors. However, much of the under-representation of women in academic science results from fewer women obtaining doctorates in these disciplines.

In contrast, women have made great strides in social science. Figure 1 shows that in the 1970s just over 20 percent of doctorates in social sciences were awarded to women. During the past decade, over half of all social science doctorates have been awarded to women. When researchers have studied social sciences, they have often included them with science disciplines. Long et.al. (2001) studies the careers of women in science and social science 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 stride in representation in the social sciences and life sciences relative to anemic gains in physical science and engineering. Ginther and Kahn (2004, forthcoming) and Ginther (2001) have shown that academic disciplines are separate labor markets that present different challenges and opportunities for women. Thus, a study that separates social science from other scientific disciplines is warranted.

Despite parity in doctorates granted, women remain under-represented in upper echelons of academic social science. Figure 3 shows that by 2001 under 30 percent of tenured faculty in the social sciences were women. However, one cannot conclude that unfair treatment in the promotion process is the underlying cause of the gender gap in academic promotion. Three alternative possibilities include that 1) women choose careers that do not have the rigid academic tenure timetable, 2) it takes time for women entering academia in the past decades to move through the ranks to achieve representation on par with the number of doctorates granted, or 3) women are less productive, particularly in terms of research, than men. Xie and Shauman (2003) find the gender publication gap is smaller than in previous studies and declining over time, suggesting a convergence in women’s and men’s academic productivity.

Career choice and productivity may in turn be affected by family choices. Long et.al. (2001) find that the impact of marriage and children on women's careers had largely been eliminated by 1995. However, men were still 4 percent more likely to receive tenure. On the other hand, Mason, Goulden, and Wolfinger (forthcoming) 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. We revisit this controversy.

A recent analysis by the NSF (NSF 2004b) is the most comprehensive study to date of the factors contributing to promotion in academic careers of scientists and social scientists. This work, carried out contemporaneously to ours and also using NSF's longitudinal Survey of Doctorate Recipients (SDR), 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. Our findings are quite different qualitatively from theirs. In the conclusion, we argue that many of the differences are because social sciences are quite different from other sciences and cannot be considered together. We return to the comparison of the NSF 2004b results and ours in the conclusion.

The remainder of the paper is organized as follows: we first describe the data and methodology. We then discuss the entry into tenure-track jobs, describe and model the tenure decision and then describe and model promotion to full professor. The final section concludes.

## **Data and Empirical Methodology**

Our analysis of promotion uses data from the 1973-2001 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.<sup>1</sup> 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. The SDR has undergone substantial changes in the sampling frame and survey content between the 1973 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 sciences who received their Ph.D. between the years of 1972 and 1991, provided they remain in the survey 10 years after the Ph.D. Individuals are excluded if they are not observed more than once or if they skip more than three surveys.

We estimate three career milestones. First, we examine the probability of obtaining a tenure track job within five years of the Ph.D. Then we restrict the analysis to those who have ever held a tenure track job to estimate two promotion milestones, the first award of tenure and the first award of full professorship.

From the 1973 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. Given the biennial nature of the survey, years until tenure and years until full professor may be measured with error.

---

<sup>1</sup> Prior to 1993, the SDR was administered by the National Research Council.

Our analyses below include both time-varying and non-time varying independent variables. Non-time varying variables include gender, race, whether foreign born, field, and aspects of the person's Ph.D. institution. Time varying independent variables include marital status, children, employer characteristics, primary and secondary work activities, government support, and limited productivity measures (discussed below). These covariates are suggested by previous studies of academic promotion (Long, Allison, and McGinnis 1993, Ginther and Kahn 2004). Table 1 gives descriptive statistics about both dependent and covariate variables at different stages of academic careers of social scientists.

Research by Ginther and Hayes (1999, 2003), Ginther (2001, 2003, 2004), and Ginther and Kahn (2004, forthcoming) demonstrates that employment outcomes differ by academic field. Thus, promotion is analyzed for all scientific fields together, social science excluding economics and economics. Previous research by Ginther and Kahn (2004) has shown that relative to other academic disciplines, economics is an outlier in terms of promoting women.

Measures of academic productivity are largely missing from the SDR data, but the SDR does ask questions about publications in the 1983, 1995, and 2001 surveys. The 1983 question refers to publications between 1980 and 1983 whereas the 1995 and 2001 questions refer to numbers of publications in the previous five years. We use these data to create rough measures of cumulative papers presented and publications for each year past Ph.D. If productivity data are missing for a particular year (as they are prior to 1980), average observed productivity is used to impute total productivity – an admitted rough correction which nevertheless seems preferable to omitting the information altogether.

We evaluate gender differences in academic careers using both probit and hazard methodologies. In our probit analyses, first we estimate whether significant gender differences

exist in the probability of a tenure track job within five years of the Ph.D. In this estimation, we exclude doctoral recipients who were unlikely to have sought academic jobs as evidenced by their immediately entering non-academic jobs upon or prior to receipt of their Ph.D.<sup>2</sup> Second, for those who hold a tenure track job at some point in their careers, we estimate probit models of the probability of having tenure 11 years after Ph.D. In this analysis, time-varying covariates are evaluated 11 years after Ph.D. receipt. Third, for those who receive tenure (by 15 years past Ph.D.), probit analyses model the probability of being a full professor 15 years after Ph.D. In these latter probits, time-varying covariates are all evaluated at 15 years past Ph.D.

We also use proportional hazard models with time varying-covariates to estimate the likelihood each year of becoming tenured, given that the individual has survived untenured until that point, and to estimate the likelihood each year of being promoted to full, given that the individual has received tenure but has not yet been promoted to full.<sup>3</sup> The hazard analysis allows time-varying covariates to change each year.

In previous work, (Ginther and Kahn 2004), we found economics to be an outlier. We therefore often present results for social sciences without economics and for economics separately. In work not shown here, we also have analyzed psychology separately because of its size. As Table 1 indicates, 61% of all social science doctorates went to psychologists. And while a large part of these doctorates were clinical psychologists who went into practice rather than academia, even among tenure-track non-tenured academics, psychologists were 43 percent

---

<sup>2</sup> Thus, we include anyone who held a post-doc, who had any academic appointment, or who had no job immediately after receiving their doctorate. When the results differ substantially by including those who begin their careers outside academia, we note this.

<sup>3</sup> Hazard models are preferred to probit models because they account for censored observations. The proportional hazard model is given by:

$$h_i(t) = \lambda_o(t) \exp[\beta_1 x_{i1} + \dots + \beta_k x_{ik}] \mathbf{C}$$

of social scientists. Overall, however, we have found that the results for psychologists are similar to results with other social sciences (excluding economics.) We therefore combine psychology with other social sciences, although we note the occasional case where psychology deviates.

### **Stepping Onto the Academic Career Ladder**

The NSF conducts a census of doctorates granted in the U.S. in its *Survey of Earned Doctorates*. Based on these data, Figure 1 illustrates the continuous growth in the percentage of the Ph.D.'s granted in social science going to females in all fields between 1974 and 2004. In the 1970s about one-fourth of social science doctorates were granted to women. In 2004, over 55 percent were granted to women. Economics is the exception where just under 30 percent of doctorates were awarded to women in 2004. As seen in the figure, economics is more similar to scientific fields (consisting of life science, physical science, and engineering) than to other social science disciplines. When economics is excluded from social sciences, almost 60 percent of doctorates are now being awarded to women. Furthermore, since 1990 a greater percentage of social science doctorates were awarded to women than in humanities. This is largely driven by the fields of psychology, sociology, and anthropology.

Given the explosive growth in social science doctorates awarded to women, we might expect to see similar patterns in academic employment. Figure 2 uses weighted estimates from the SDR to show the changing percentage female in each academic rank over the quarter century. The general upward trend in the percentage female among assistant professors mirrors the trend in social science Ph.D. awards from Figure 1. However, as one moves up the academic ranks,

---

where the hazard of promotion  $h_i(t)$  is a function of the baseline hazard  $\lambda_o(t)$  and covariates,  $x$  in equation (1). The covariates in equation (1) influence the scale of the hazard rate and are not a function of time. In addition, the

the percentage female within rank drops relative to the supply. In 2001, 54 percent of social science doctorates were awarded to women, but only 47 percent of assistant professors were female. The gap between doctorates and assistant professors remains the same even if economics is excluded from social sciences. Of course, part of this may be due to the fact that assistant professors in 2001 combined women who just graduated with those more years out when women were a somewhat smaller proportion of graduates. The bottom panel of Figure 2 shows that the percentage of female assistant professors in economics decreased in the late 1990s as the percentage of doctorates awarded to women held steady at 25 percent. In contrast, Ginther and Kahn (forthcoming) show that trends in doctorates awarded in the sciences are mirrored in the percentages of women within rank. In the case of engineering, the percentage female among assistant professors is greater than the percentage female among doctorates.

Among those women entering academia, fewer women than men have tenure track jobs within five years of Ph.D. receipt. Table 1 indicates that 43 percent of men held tenure track jobs within five years of the Ph.D. compared with 38 percent of women. These gender differences among the percentages female in tenure track jobs may not represent different jobs among otherwise identical men and women, but instead be picking up a large variety of factors such as field and Ph.D. quality that are correlated with gender. Model 2 of Table 2 shows the gender differences once we control for covariates.<sup>4</sup> After controlling for age at Ph.D., cohort, race, origin, Ph.D. quality tier<sup>5</sup>, field, marriage and children in Model 2, there is no significant gender difference in the likelihood of being in a tenure track job five years after Ph.D. receipt.

---

hazard for any one individual is a fixed proportion to the hazard for any other person in the sample.

<sup>4</sup> Results of the entire probit specifications are available from the authors by request.

<sup>5</sup> Quality tiers are based on rankings from the Carnegie Foundation for the Advancement of Teaching and of Comprehensive and Liberal Arts Institutions.

Marriage and fertility decisions may be affecting women's tenure track employment differently than men's. To investigate this possibility, we include interaction terms between female and marital status, total number of children, and an indicator for having children less than six years of age (Table 2 Model 3). The results suggest that indeed, gender differences depend on family ties. Moreover, this effect is sometimes different in economics from other social sciences, although the economics sample is small (400 people) and some results could possibly be dominated by a few individuals.

With family characteristics entered as controls, the female coefficient in all social science fields becomes positive and statistically significant. This indicates that single, childless women are 16.7 percent more likely to get a tenure track job within 5 years of the Ph.D. than single, childless men. This averages a difference of 17.1% in economics and 12.4% in other social sciences.

Being married increases men's probability of getting a tenure track job by a whopping 23 percent in social science as a whole and by 51 percent in economics. Women's chances are also helped somewhat by marriage. Here, the difference between economics and other social sciences is large: Marriage increases women's likelihood of advancing to a tenure track job by a modest 6.4% in non-economics social sciences but by 28.8% in economics.<sup>6</sup> As a result, in social science as a whole a married man without children and a married woman without children are about equally likely to have a tenure track job five years after Ph.D (both in economics and other social sciences).

---

<sup>6</sup> This calculation adds the coefficient of Married to the coefficient of Female\*Married. Many other numbers later in this section similarly add several coefficients. For instance, the impact on men of one young child adds the coefficient on Total Children and the coefficient on Children <=6, while the impact on women adds to this sum the coefficient of Female\*Total Children and the coefficient of Female\*Children<=6. We note in the text when the sum is not significant.

Children create a marked divergence between men and women. For social science as a whole, the presence of a pre-kindergarten aged child lowers women's likelihood of having a tenure track job by about 10%. In contrast, for men, pre-kindergarten children increase men's likelihood of proceeding to a tenure track job, particularly in economics (19%) but also somewhat (5%) in the other social sciences. School age children have no effects on either sex in the social sciences outside of economics and psychology. Within economics, the results are surprising. *Both* men and women with school aged children are 9% less likely than those without children to get tenure track jobs, *ceteris paribus*. In psychology, school age children increase men's likelihood of proceeding to tenure track jobs but has no impact on women's.<sup>7</sup>

## **Empirical Analysis of Moving Up the Career Ladder: Promotion of Academic Social Scientists**

### **A. *Estimates of the Probability of Promotion to Tenure***

Returning to Figure 2, the dashed line shows the changing percentage female among associate professors, while Figure 3 shows the percentage female among all tenured faculty. In social science as a whole, the increasing trend in associate professorships mirrors trends in assistant professorships 5 to 10 years earlier, but the levels are not comparable. For instance, 29 percent female among associates in 1991 is lower than the 34 percent female among assistant professors six years earlier. The gap narrows by one percentage point when economics is excluded. In Figure 3, the percentage of tenured faculty who are female, which combines the trends in associate professors with those in full professors, has exhibited faster growth in the social sciences than in the sciences, increasing eight percentage points between 1991 and 2001 and somewhat faster when economics is excluded. Yet by 2001, only 28, 32, and 12 percent of

---

<sup>7</sup> Psychology results available upon request.

tenured faculty were female in social science, social science excluding economics, and economics respectively.

The top panel of Table 3 summarizes the impact of gender on the probability of being promoted to tenure as captured by probit and hazard analysis, before we allow gender differences in the impact of family variables. The top half of Table 4 summarizes tenure results when family-gender interactions are included.<sup>8</sup>

The first row of Table 3 shows the probit analysis of gender differences in the probability of tenure by 11 years from the doctorate controlling for all variables including marriage and children, but without interaction terms. In social sciences, women are nine percent less likely to be tenured. This difference drops to five percent and marginal significance ( $p = .09$ ) when economics is excluded. In economics, women are on average a full fifty two percent less likely to be promoted than men 11 years past PhD. While the sample of tenure-track women in economics is small here and therefore standard errors are large, we are still 95% sure that the gender difference is at least thirty two percent.

Hazard analyses are able to capture the entire year-by-year pattern of the likelihood of receiving tenure and thus in the duration until tenure. A particular strength of this analysis is that it takes into account those observed to not have received tenure by the last survey. The second row of Table 3 presents the risk ratios from a proportional hazards model of promotion regressed on a dummy variable for gender. This risk ratio can be interpreted as the effect of being female rather than male on the probability of receiving tenure. A number less than one indicates that on average the likelihood of tenure receipt in any given year for females is less than of males. In social science women are 13 percent less likely and excluding economics 11 percent less likely

---

<sup>8</sup> Detailed parameter estimates for the probit and hazard models are available by request.

than men to get tenure. In economics women are 20 percent less likely to get tenure, but this is marginally significant ( $p = .13$ ).

The third row of Table 3 (Model 1) shows the female risk ratio after accounting for differences in academic field, demographic, family and employer characteristics, primary and secondary work activity, and government grant support. The fourth row of Table 3 shows the female risk ratios that include productivity as well (Model 2). The risk ratios increase, indicating a widening gender gap, after controlling for these covariates in each field. Women are 17 percent less likely in all social sciences and 16 percent less likely when economics is excluded. As shown in Ginther and Kahn (2004) economics is an outlier and the worst discipline in terms of granting tenure to women. In Table 3, women are 31 percent less likely than men to get tenure in economics.

Economists have argued that gender differences in employment outcomes can be explained by productivity differences. However, our results belie this explanation. Including productivity only reduces the gender gap by two percentage points in social sciences even when economics is excluded. When productivity is included for economists, it actually increases rather than decreases the gender gap, albeit very slightly.

The gender gap in the hazard analysis, therefore, is larger than in the probit analysis. Of the two, we deem the hazard analysis more accurate because it compares progress towards tenure each year, not just at a single point eleven years after Ph.D. receipt.

For social sciences except economics, family has less of an impact on the gender gap than it did on the likelihood of entering a tenure track job, but still sizable in some cases. Table 4 reports probit coefficients of these gender and family terms when interaction terms for gender and family are included in addition to other covariates. Marriage does not significantly affect

either men's or women's tenure likelihoods. The same is true for having a grade school child. However, having small children hurts women in economics (-44.6%) and in psychology (-16.4%).<sup>9</sup> In non-economics social sciences, single women are not significantly different than single men and married women are not significantly different than married men. The marginally significant and relatively small gender gap in the non-economics social sciences (5.4%) therefore comes from the differences between men and women with small children, and perhaps to some extent due to the accumulation of small differences between men and women of other family situations that were each statistically insignificant on their own.

Economics, however, is once again the outlier. In economics, single women have a 32% lower likelihood of obtaining tenure than single men and married women have a 33 percent lower likelihood than married men. As pointed out above, young children hurt women's chances of receiving tenure by a very large amount (44.6 percent on average), although grade school children continue to have no effect. Marriage *might* increase men's tenure likelihood ( $P=.22$ , coefficient = 13%) as might young children ( $P=.12$ , coefficient = 12.5%) and young children ( $P=.21$  coefficient = 5%). Consequently, the estimated average difference between a married woman with a young child and a married man with a young child, combining both the large impact of gender alone and the large impact of small children, is over 80%! Again, the sample size is small so the magnitude cannot be pinpointed with great accuracy. Nevertheless, the difference is huge.

In these specifications, other variables were allowed to have different coefficients for men and women. We find no significant gender differences in the effect of working at a Research I university, working at a private university, year of PhD, and receiving a doctorate from a Research I university. However, the coefficients on these female interaction terms are

---

<sup>9</sup> Psychology results available on request.

negative. Although none of the family or additional female-interaction terms are significantly different from zero, the negative signs on these variables suggest that women are disadvantaged relative to men along a number of dimensions that we cannot fully explain. Furthermore, Table 1 indicates that women are significantly less productive than men 11 years past PhD, but the average difference is only one publication, a publication gap that seems too small to explain the substantial gender gap in promotion to tenure.

***B. Estimates of the Probability of Promotion to Full Professorship***

Returning to Figure 2, among full professors in social science, the percentage female has been steadily increasing over the quarter century shown but by 2001 had only achieved the level of female representation that had been achieved in assistant professorships and Ph.D. recipients in the early 1970s. Disaggregated, the same can be said for physical sciences and engineering. The rate of increase of full professorships is slower than that of associate professors, and the female representation among full professors by 2001 – 22 percent – is substantially less than the female representation among associate professors a decade earlier. We see similar trends when economics is excluded from social science in Panel B. Economics remains an outlier where only 10 percent of full professors are female. Of course, since academics can remain full professors for decades, these facts in themselves do not tell us whether the likelihood of becoming full is different for male and female associate professors with tenure. For that, we must turn to longitudinal analysis using either probit or hazard methodology.

The bottom panels of Tables 3 and 4 summarize the impact of gender on promotion to full professorship.<sup>10</sup> The probits and hazards reported here use two different beginning time points. The probits estimate the likelihood of having a full professorship 15 years after Ph.D.

The hazards starts with *first tenure receipt* and studies the likelihood of becoming a full professor and the duration of time it takes to get there.

The first row of the bottom panel of Table 3 gives the probit coefficient on promotion to full professor (with covariates.). For all social sciences combined women are eight percent less likely to be promoted to full. When economics is excluded the difference is not very different, dropping to seven percent. In economics, women are 21 percent less likely to be promoted to full, but this is marginally significant ( $p=.12$ ). Note that most results regarding the likelihood of associate professors in economics obtaining full professorships will tend to be insignificant simply because only a very small number of women in economics are tenured associates in the sample at risk of being promoted to full professor.

In the hazard analysis of Table 3, as before, the second row of the panel includes no covariates. The risk ratio from the proportional hazard analysis (without covariates) indicates highly significant gender differences in promotion to full. On average, the likelihood of promotion to full in any given year for females is 78 percent of that for males. Excluding economics increases the risk ratio by only one percentage point. As before, the risk ratio for economics is lower than for other social science disciplines, but is not statistically significant.

Adding in a full set of controls in the last two rows of Table 3, however, increases the risk ratio in both the full sample and social science excluding economics by two percentage points: women are now only 18 percent less likely to become full professors than men. Comparing the second and third rows, there is a slight increase in the gender gap when productivity covariates are included. Indeed, we see in Table 1 that the publication gender gap among tenured professors is substantial, at 2.3 papers fifteen years past PhD.

---

<sup>10</sup> Detailed parameter estimates for the probit and hazard models are available on request.

The gender difference in promotion to full for economics actually widens first when basic covariates are controlled for and then again when publications are controlled for, although it remains insignificant because of small sample size. Taken together, women remain significantly less likely to be promoted to full professor after controlling for covariates including productivity.

Details on the family variables are reported in the bottom panel of Table 4. Adding gender-family interaction terms allows us to pinpoint where gender differences lie. Thus, in social science as a whole, single women and single men have statistically insignificant differences in their likelihood of being promoted to full professor. However, this combines psychology<sup>11</sup>, where there is no difference, with economics and other social sciences which both have large female disadvantages (18%). Marriage has no significant effect on either men or women in psychology and economics, but surprisingly has a positive impact on women (but not men) in the other social sciences. In all fields, however, married men and married women are not different in terms of promotion to full.

Neither school aged nor pre-kindergarten children affects men's promotion to full. The impact of children on women depends on the age of the children. Having school aged children *lowers* the probability of becoming full by six percent – although this is dominated by psychology -- while having young children on average has no effect on full professorship.<sup>12</sup>

A few other variables were shown to have different impacts on men and women only in economics. Presently working at a private university hurts women's chances of becoming full but not men's, reducing the likelihood of promotion by 55 percent. Similarly, women who received their doctorate from a Research I were disadvantaged relative to men. However, this difference is only marginally significant at ( $p = .08$ ).

---

<sup>11</sup> Psychology results available on request.

<sup>12</sup> It may slow women's promotion in economics, but again, the sample is small and results are weak, with  $P=.13$ .

## **Conclusions: Putting Gender Differences in Promotion into Perspective**

The preliminary results in this paper show that within social science as a whole, there are large, appreciable gender differences in the probability of receiving tenure and in the probability of promotion to full professor. Moreover, we cannot explain the differences that do exist in tenure and promotion to full professor by differences in academic field, demographic and employer characteristics, primary and secondary work activity, government grants, and publications. As shown in Ginther and Kahn (2004), economics has the greatest gender differences, with a 30 percent gender gap in achieving tenure.

At the entry stage, however, while there is a 6 percent gender difference in the likelihood of starting out in a tenure track job (within 5 years of Ph.D. receipt), this gap is no longer significant after controlling for all covariates. Family variables affect men and women differently. In fact, single women are significantly more likely than single men to enter tenure track jobs in all social science fields combined when controlling for gender differences in family variables. These results echo previous findings in Ginther and Kahn (forthcoming) which show that women in science are less likely to take tenure track jobs given the presence of young children.

The similarities between science and social science employment outcomes diverge when we consider promotion to tenure and full professor. Ginther and Kahn (forthcoming) show no gender differences in promotion to tenure or full professor for all science fields combined. In contrast, the gender tenure gap in all social science disciplines ranges between 9 to 15 percent. Economics is the outlier, with an estimated tenure gap of 52 percent 11 years past PhD.

The gender full professor gap in social science ranges between 8 to 22 percent. Economics is again worse than all social science disciplines, however, its full professor gap is not statistically significant, most likely the result of very few women in the associate professor ranks.

It is striking that these promotion gaps are not readily explained by covariates including productivity measures and family characteristics. Men are significantly more productive than women in the sample. However, these differences are small, one publication at 11 years and 2.3 publications at 15 years past PhD. 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 disciplines. Pre-kindergarten children lower women's likelihood of getting tenure in economics and psychology. This crucial stage in the development of women's academic careers in social science coincides with their child-bearing window. However, older children have no significant effect on either men or women on the probability of getting tenure.

Grade school children reduce a woman's likelihood of promotion to full professor in social science overall and social science excluding economics. This gender difference is not surprising, given that men spend much less time than women in childcare, even in professional couples. Preston (2004) finds that those male scientists who do childcare have similar impacts on their academic careers.

Some of these gender differences in family variables are likely to be selection. The widespread labor market disadvantages of single men suggests that the most able men tend to get

married and have children. It is possible that the negative impact of children on women entering academic careers is also selection. We cannot know whether the women who have children during the “formative” years of their careers would be less devoted to their careers even in the absence of children (i.e. a selection story), or are being hampered by their presence. To some extent, this is a chicken and egg problem.

A recent NSF report (NSF 2004b) using the same data set considered gender differences in academic careers in all sciences, including social sciences. What the present paper demonstrates, coupled with our 2004 paper on the “hard” (not social) sciences, indicates is that many of their findings are very different once the social sciences and the hard sciences are separated. NSF found no gender differences for entering tenure track jobs. We find that single women have greater rates of entering tenure track jobs in the social sciences and hard sciences, but that

Long et. al. (2001) and NSF

Where we find that single women have greater rates entering tenure track jobs (*ceteris paribus*), the Our results coincide with the NSF report that finds lower rates of women promoted to full. Where the NSF found that marriage hurt women’s careers at various stages, we find that marriage in the absence of children does not hurt. While NSF found negative impacts of children all levels, we find negative effect of children at the point of entry into tenure track jobs and in promotion in selected fields. What accounts for these very different results?

There are some small differences in our research that are *not* responsible for the large discrepancies in results. For instance, our analysis uses the most recent data available from the 2001 SDR. Also, other studies stopped their analysis in 1999 or earlier. NSF 2004a included a somewhat difference set of controls and did not include any publication controls.

However, the important explanation for differences between our results and the others is that we are looking only at the social sciences. In contrast, both Long et. al. (2001) and NSF define science as including life science, physical science, engineering, and social science. Indeed, there is no gender difference in academic promotion in the sciences which we have demonstrated in previous work Ginther and Kahn (forthcoming).

Our results on promotion in social sciences are similar to findings by Ginther and Hayes (1999, 2001) for faculty in the humanities. Using the 1977-1995 waves of the SDR and performing similar estimates, Ginther and Hayes find a gender promotion gap ranging between 7 to 9 percent. Some of the promotion gap in the humanities is explained by fertility and the treatment of work experience.

Taking all of this work together, women's disadvantages in promotion to tenure not explained by any covariates are largest in economics and other social sciences, are smaller in the humanities (in part explained by marriage and family characteristics), and non-existent in the physical or life sciences or in engineering once all variables are taken into account.

Future work will examine what factors besides productivity, marriage and children are most responsible for the large and pervasive gender promotion gap in the social sciences.

## References

- Allison, Paul D. 1995. *Survival Analysis Using the SAS System*. Cary, NC: The SAS Institute, Inc.
- 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."
- 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. 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.
- 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.
- National Science Foundation (NSF). 2004a. Women, Minorities, and Persons with Disabilities in Sciences and Engineering: 2004. NSF 00-327. Arlington, VA.
- 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](http://cheminfo.chem.ou.edu/~djn/diversity/briefings/Diversity%20Report%20Final.pdf).
- 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.
- Rosser, S. V. (2004). *The Science Glass Ceiling* New York: Routledge.
- Xie, Yu and Kimberlee A. Shauman. *Women in Science: Career Processes and Outcomes*. Cambridge MA: Harvard University Press, 2003.

Table 1: Gender Differences in Mean Characteristics

Variables:	All Doctorates <sup>a</sup>		Tenure-Track <sup>b</sup>		Tenured <sup>c</sup>	
	Female	Male	Female	Male	Female	Male
Tenure Track within 5 Years of Ph.D.	<b>0.384</b>	<b>0.428</b>				
Promotion to Tenure within 11 years of Ph.D.			<b>0.552</b>	<b>0.647</b>		
Promotion to Full within 15 years of Ph.D.					<b>0.250</b>	<b>0.352</b>
Age at Ph.D.	<b>33.630</b>	<b>32.658</b>	<b>32.615</b>	<b>31.921</b>	<b>32.176</b>	<b>31.393</b>
African American	<b>0.124</b>	<b>0.096</b>	0.130	0.110	0.093	0.095
Native American	0.008	0.012	0.008	0.011	<b>0.005</b>	<b>0.016</b>
Asian	0.091	0.079	0.079	0.073	0.069	0.066
Other Race	0.005	0.003	0.006	0.003	0.002	0.000
Foreign Born	0.127	0.128	0.128	0.140	0.104	0.112
Year of Ph.D.	80.807	80.837	<b>79.849</b>	<b>80.493</b>	<b>77.724</b>	<b>78.857</b>
Ph.D. from Research I	0.656	0.647	0.747	0.729	0.763	0.728
Ph.D. from Research II	0.120	0.137	<b>0.113</b>	<b>0.145</b>	<b>0.112</b>	<b>0.152</b>
Ph.D. from Doctorate I	0.139	0.134	0.090	0.086	0.088	0.078
Ph.D. from Doctorate II	0.029	0.028	0.021	0.021	0.019	0.026
Married	<b>0.644</b>	<b>0.751</b>	<b>0.610</b>	<b>0.775</b>	<b>0.610</b>	<b>0.806</b>
Total Children	<b>0.774</b>	<b>1.101</b>	<b>0.721</b>	<b>1.187</b>	<b>0.735</b>	<b>1.138</b>
Children < 6	<b>0.311</b>	<b>0.423</b>	<b>0.258</b>	<b>0.338</b>	<b>0.135</b>	<b>0.179</b>
Cumulative Employers			1.793	1.813	2.143	2.054
Private University			0.267	0.288	0.272	0.279
Research I			0.236	0.212	0.243	0.216
Liberal Arts I			0.272	0.302	0.281	0.299
Medical School			0.115	0.104	0.114	0.136
Primary Work Research			<b>0.185</b>	<b>0.236</b>	<b>0.170</b>	<b>0.239</b>
Primary Work Teach			<b>0.573</b>	<b>0.525</b>	<b>0.552</b>	<b>0.497</b>
Primary Work Manage			0.105	0.118	0.123	0.120
Secondary Work Research			0.418	0.417	0.413	0.433
Secondary Work Teach			<b>0.159</b>	<b>0.223</b>	0.172	0.196
Secondary Work Manage			0.108	0.113	0.158	0.159
Secondary Work Other			0.172	0.156	0.148	0.139
Government Support, Current Yr			0.248	0.243	0.278	0.259
Cumulative Yrs of Govt. Support			1.109	1.132	1.627	1.726
Cumulative Papers			5.902	6.545	<b>6.086</b>	<b>8.474</b>
Cumulative Publications			<b>5.504</b>	<b>6.475</b>	<b>6.230</b>	<b>8.542</b>
Clinical Psychology	<b>0.322</b>	<b>0.269</b>	0.146	0.126	0.142	0.126
Psychology	<b>0.286</b>	<b>0.242</b>	<b>0.289</b>	<b>0.235</b>	<b>0.302</b>	<b>0.254</b>
Economics	<b>0.063</b>	<b>0.151</b>	<b>0.079</b>	<b>0.159</b>	<b>0.083</b>	<b>0.153</b>
Sociology	0.158	0.153	0.250	0.220	0.258	0.225
Political Science	<b>0.067</b>	<b>0.099</b>	<b>0.103</b>	<b>0.146</b>	<b>0.102</b>	<b>0.140</b>
Observations	2830	2762	956	1072	569	756

Notes: Numbers in **Bold**—male and female values significantly different at 1% level; *Italics*—statistically different at 5% level. Tests are two-sided. <sup>a</sup> Excluding doctoral recipients who were unlikely to have sought academic jobs as evidenced by their immediately entering non-academic jobs upon or prior to receipt of their Ph.D. <sup>b</sup> Time-varying variables evaluated 11 years from Ph.D. <sup>c</sup> Time-varying variables evaluated 15 years from Ph.D.

Table 2: Probability of Having Tenure Track Appointment within 5 Years of Ph.D. by Field  
1973-2001 Survey of Doctorate Recipients

	All Social Science			Social Science X Econ			Economics		
	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
Female	<b>-0.057</b> [0.016]	-0.020 [0.017]	<b>0.167</b> [0.030]	<b>-0.054</b> [0.017]	-0.027 [0.018]	<b>0.124</b> [0.034]	-0.020 [0.049]	0.022 [0.049]	<b>0.171</b> [0.057]
Married		<b>0.135</b> [0.022]	<b>0.233</b> [0.034]		<b>0.096</b> [0.023]	<b>0.161</b> [0.037]		<b>0.431</b> [0.065]	<b>0.513</b> [0.075]
Total Children		0.000 [0.024]	0.055 [0.033]		-0.026 [0.026]	0.023 [0.036]		<b>0.207</b> [0.063]	<b>0.277</b> [0.074]
Children < 6 = 1		-0.002 [0.010]	0.013 [0.014]		0.003 [0.010]	0.025 [0.016]		<b>-0.083</b> [0.031]	<b>-0.089</b> [0.038]
Female * Married			<b>-0.156</b> [0.044]			<b>-0.096</b> [0.047]			-0.226 [0.158]
Female * Total Children			<b>-0.136</b> [0.049]			<b>-0.117</b> [0.052]			-0.263 [0.184]
Female * Young Children			-0.035 [0.019]			<b>-0.043</b> [0.020]			-0.001 [0.063]
Demographics	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Degree Characteristics	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Fields	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

Notes: Coefficients report change in probability. Standard Errors in Parentheses. **Bold** Significant at 1%; **Bold Italics** Significant at 5%.  
Underline Significant at 10%

Table 3: Gender Differences in the Probability and Hazard of Promotion  
1973-2001 Survey of Doctorate Recipients

	<u>Full Sample</u>	<u>Social Science x Economics</u>	<u>Economics</u>
<b><u>Promotion To Tenure</u></b>			
<b>Female Probit Coefficient</b>	<b>-0.090</b>	<u>-0.054</u>	<b>-0.520</b>
Promoted 11 Years Past Ph.D. (Covariates ex. Productivity)	(0.00)	(0.09)	(0.00)
<b><u>Risk Ratio Estimate:</u></b>			
<b>Female Risk Ratio</b> (No Covariates)	<b>0.873</b> (0.01)	<b>0.886</b> (0.02)	0.796 (0.13)
<b>Model 1 Female Risk Ratio</b> (Covariates ex. Productivity)	<b>0.831</b> (0.00)	<b>0.841</b> (0.00)	<b>0.694</b> (0.03)
<b>Model 2 Female Risk Ratio</b> (Including Productivity Covariates)	<b>0.846</b> (0.00)	<b>0.857</b> (0.01)	<b>0.686</b> (0.03)
<b><u>Promotion To Full</u></b>			
<b>Female Probit Coefficient</b>	<b>-0.083</b>	<b>-0.072</b>	-0.209
Promoted 15 Years Past Ph.D. (Covariates ex. Productivity)	(0.02)	(0.04)	(0.12)
<b><u>Risk Ratio Estimate:</u></b>			
<b>Female Risk Ratio</b> (No Covariates)	<b>0.784</b> (0.00)	<b>0.794</b> (0.00)	0.729 (0.18)
<b>Model 1 Female Risk Ratio</b> (Covariates ex. Productivity)	<b>0.814</b> (0.01)	<b>0.819</b> (0.02)	0.670 (0.16)
<b>Model 2 Female Risk Ratio</b> (Including Productivity Covariates)	<b>0.817</b> (0.01)	<b>0.823</b> (0.02)	0.657 (0.14)

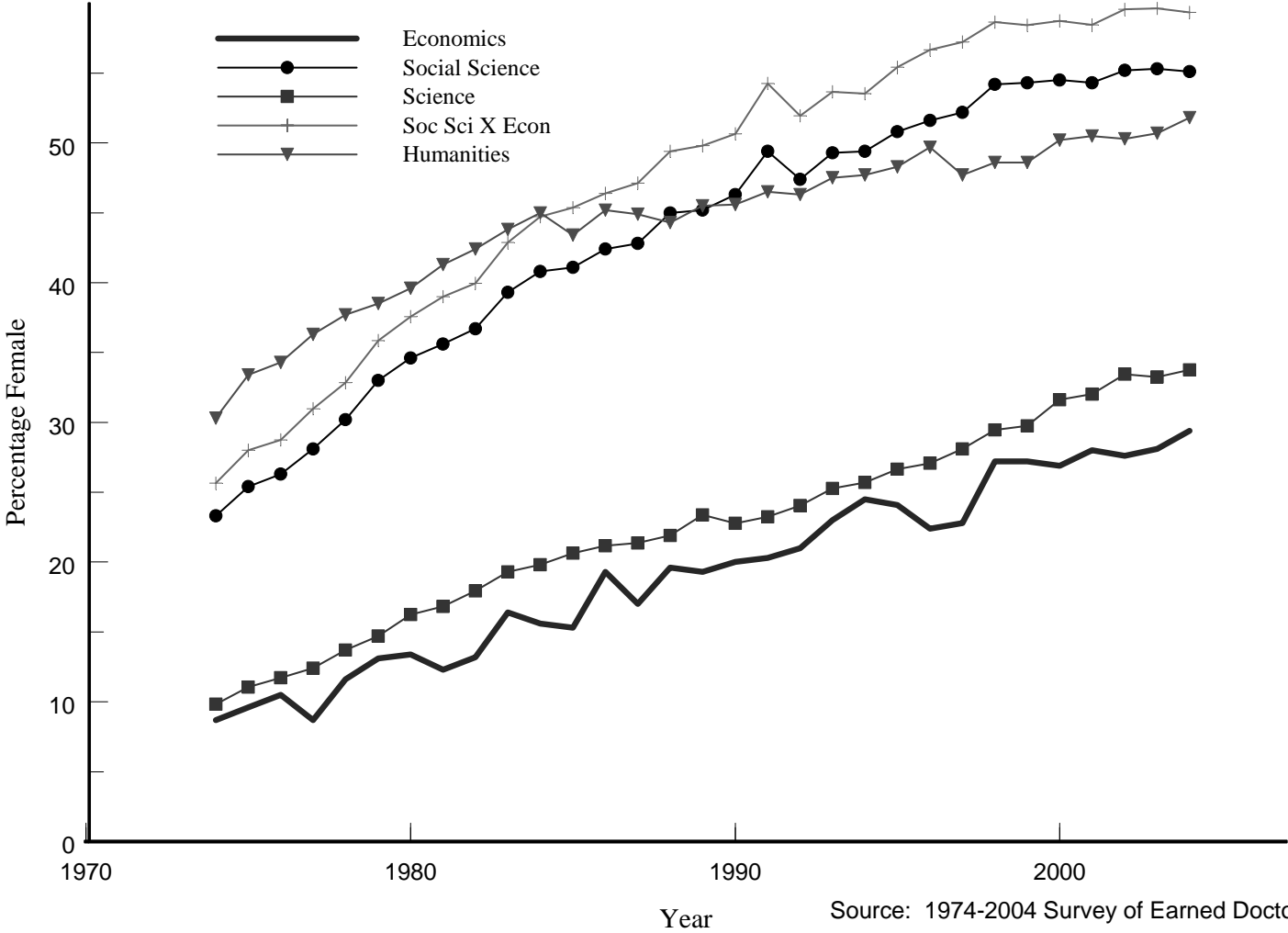
Notes: P-values in parentheses. Probit coefficient reports change in probability. Hazard coefficients are risk ratios—estimate the impact of female on the likelihood of promotion in each period. **Bold** Significant at 1%; **Bold Italics** Significant at 5%; Underline Significant at 10%.

**Table 4: Marriage and Children in Probit Analysis of Tenure and Promotion to Full Professor, 1973-2001 Survey of Doctorate Recipients**

	<u>Full Sample</u>	<u>Social Science x</u> <u>Economics</u>	<u>Economics</u>
<b>Promotion to Tenure (11 years past Ph.D.)</b>			
Female	-0.050 [0.052]	-0.040 [0.056]	-0.316 [0.178]
Married	0.060 [0.053]	0.050 [0.058]	0.131 [0.131]
Total Children	0.006 [0.021]	-0.006 [0.024]	0.051 [0.038]
Children < = 6	-0.013 [0.051]	-0.035 [0.056]	0.074 [0.083]
Female * Married	-0.031 [0.072]	-0.029 [0.077]	-0.018 [0.142]
Female * Total Children	0.020 [0.038]	0.036 [0.042]	-0.022 [0.076]
Female * Children <= 6	-0.130 [0.085]	-0.086 [0.090]	-0.550 [0.315]
<b>Promotion to Full (15 years past Ph.D.)</b>			
Female	-0.065 [0.063]	-0.048 [0.067]	-0.179 [0.256]
Married	-0.001 [0.059]	0.006 [0.063]	0.074 [0.197]
Total Children	0.019 [0.022]	0.029 [0.024]	-0.060 [0.071]
Children < = 6	-0.057 [0.058]	-0.072 [0.063]	-0.100 [0.177]
Female * Married	0.051 [0.083]	0.042 [0.086]	0.118 [0.377]
Female * Total Children	<b>-0.081</b> [0.039]	<b>-0.086</b> [0.041]	-0.074 [0.181]
Female * Children <= 6	0.117 [0.104]	0.151 [0.112]	-0.257 [0.335]

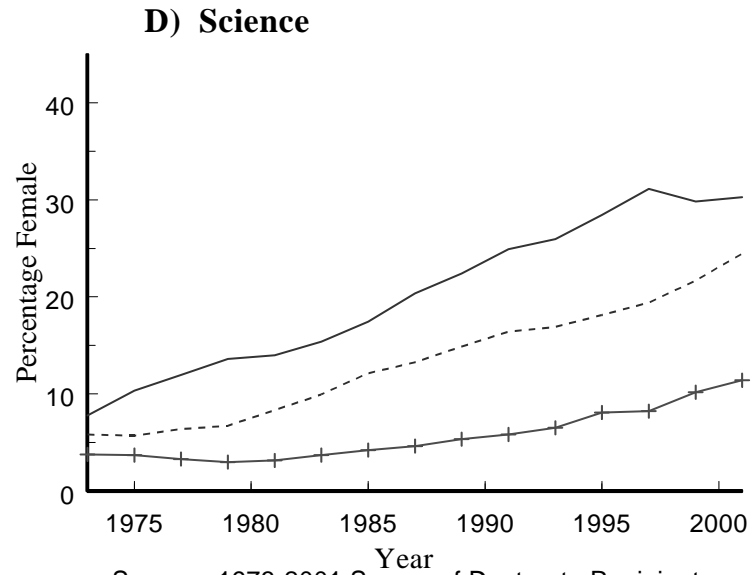
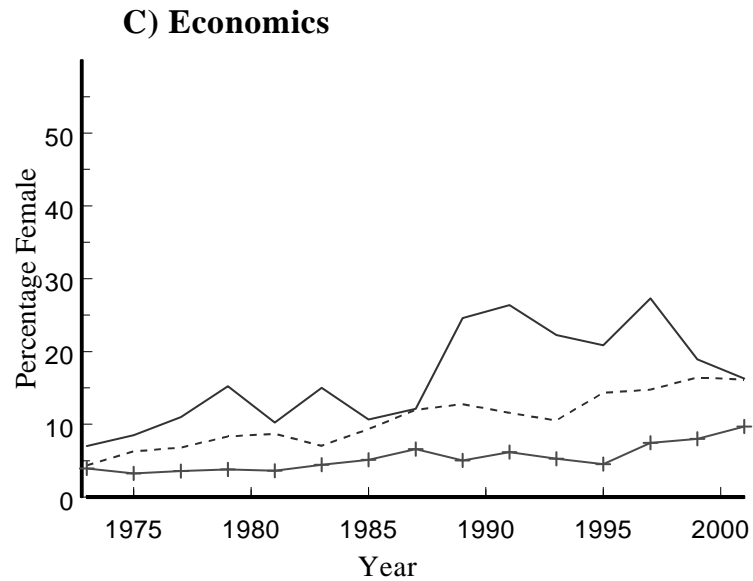
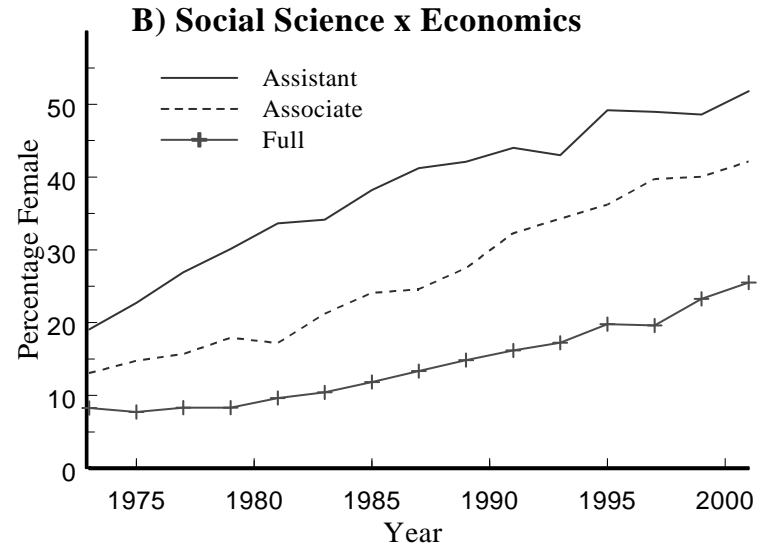
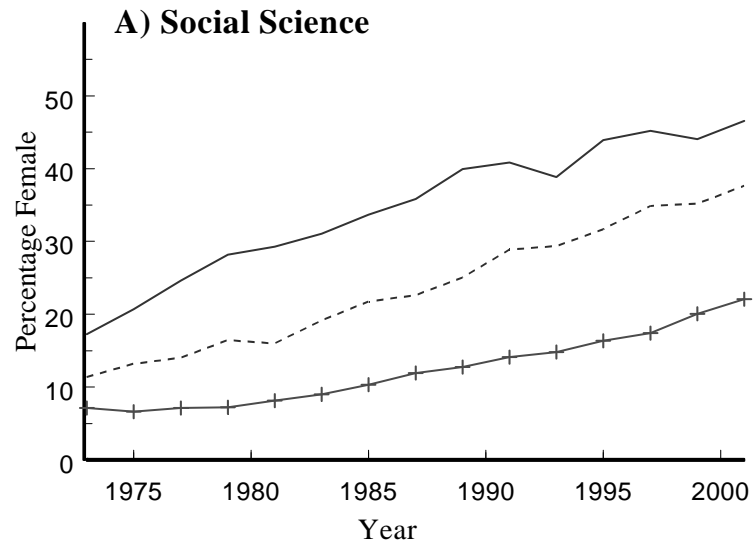
Notes: Coefficients report change in probability. Standard Errors in brackets. **Bold** Significant at 1%; **Bold Italics** Significant at 5%; Underline Significant at 10%. All equations include additional controls for demographics, degree characteristics and fields.

**Figure 1: Percentage of Doctorates Granted to Females, 1974-2004 Survey of Earned Doctorates**



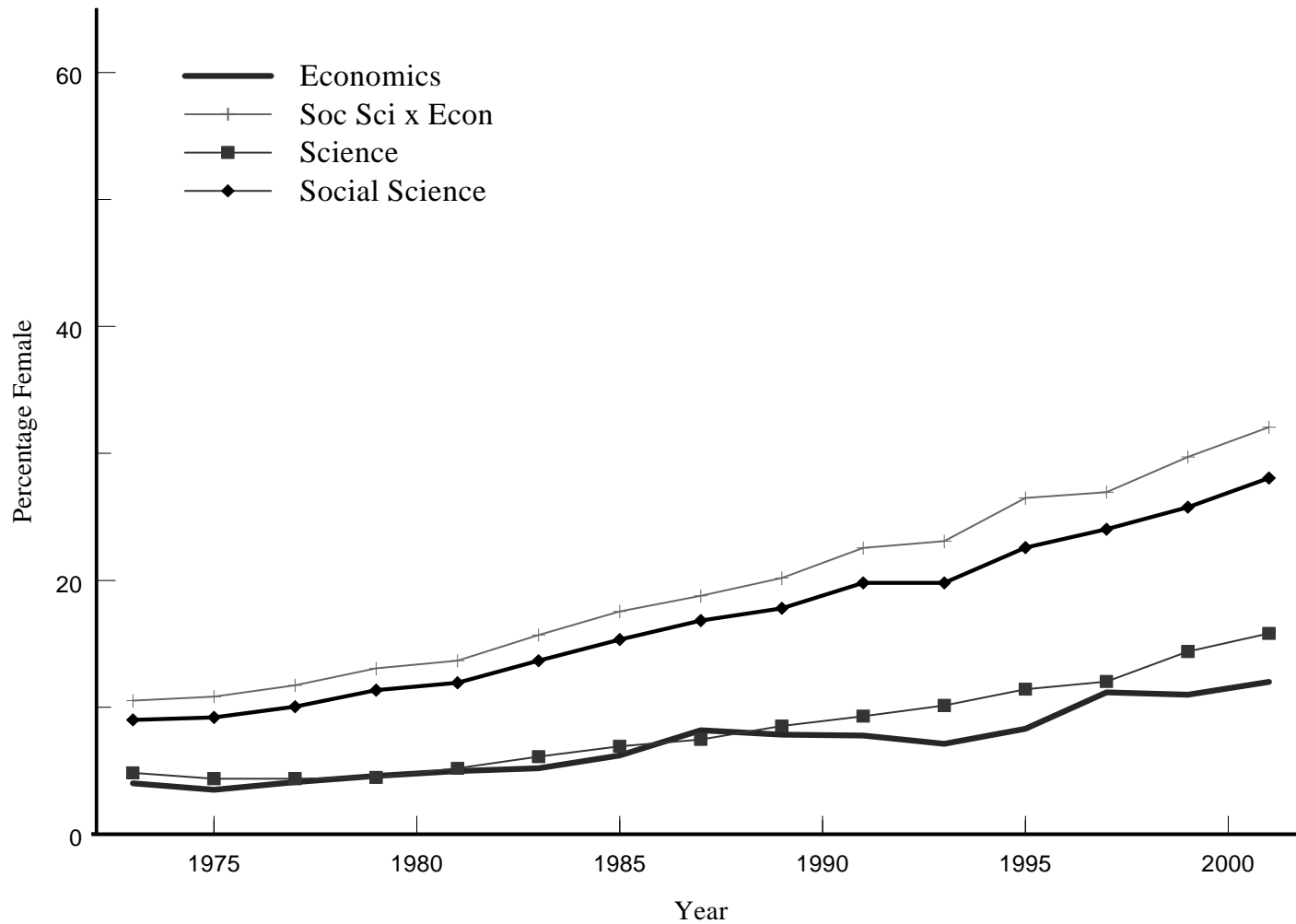
Source: 1974-2004 Survey of Earned Doctorates

**Figure 2: Percentage Female by Academic Rank, Social Science**



Source: 1973-2001 Survey of Doctorate Recipients

**Figure 3: Percentage of Tenured Faculty who are Female, by Discipline 1973 - 2001**



Source: 1973-2001 Survey of Doctorate Recipients