The Postdoc and Women's Academic Careers—More Questions than Answers

for presentation at:
National Summit on Gender and the Postdoctorate
March 11, 2010

Donna K. Ginther
University of Kansas
Shulamit Kahn
Boston University

Research Funded by NSF Grant SES-0353703

Disclaimer

- The use of NSF data does not imply NSF endorsement of the research, research methods or conclusions

  contained in this report.

Gender and Science

- Research is based on:

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

Earlier version: NBER Working Paper W12691, November 2006.

Economist's Perspective

- Gender Differences in employment outcomes result from
  - Differences in productivity
  - Differences in choices
  - Imperfect Competition—Monopsony
  - Job Matching
  - Discrimination

Research Questions

- Does Science Promote Women?
  - We examine gender differences in:
    - Tenure Track jobs
    - Promotion to Tenure
    - Promotion to Tenured, Full Professor

Research Questions

- How does the Postdoc affect careers?
  - What factors are associated with transitioning from the postdoc to an academic job?
  - What is it about the postdoc that affects women differently than men?

Preview of Results

- No gender difference in obtaining tenure-track job. However,
  - Married women with children significantly less likely to get a tenure track job within 9 years of PhD.
- We find negligible gender differences in promotion.
- Postdoc is critical point in women's academic careers.

Organizing Principles

- Based on previous research:
- There is no single scientific labor market
  - Must disaggregate the data
- Gender differences need a context
  - Make comparisons across fields

Data

- Use 1973 - 2006 Survey of Doctorate Recipients (SDR)
  - Biennial, Longitudinal Survey of U.S. Doctorates
  - Used by NSF to analyze scientific labor force
- **Longitudinal Sample**: Individuals who received their Ph.D. between 1972 and 1996 observed between 1973 and 2006.

Data

- Academics in the Sciences:
  - Life Sciences
    - Agriculture and Food Science
    - Biology and Life Sciences
  - Physical Sciences
    - Chemistry
    - Earth Science
    - Physics
    - Computer Science / Mathematics
  - Engineering

Data

- Dependent variables:
  - Probability of Tenure Track job within 9 years of PhD
  - Probability of Promotion to tenure and full professor
  - Duration between PhD and promotion to tenure and full professor

Data

- Independent variables:
  - Gender
  - Age PhD
  - Year PhD
  - Race
  - Academic field
  - Degree institution characteristics

Data

- Time-varying Independent variables:
  - University/College employer characteristics
  - Rank and Tenure status
  - Primary / Secondary work activities
  - Government Support of Research
  - Publications****

Data Difficulties

- Biennial Survey
- Changes in the sampling frame
- Numerous missing observations, required a lot of imputation
- Imputed productivity from three years of observed publications
  - 1983, 1995, 2001

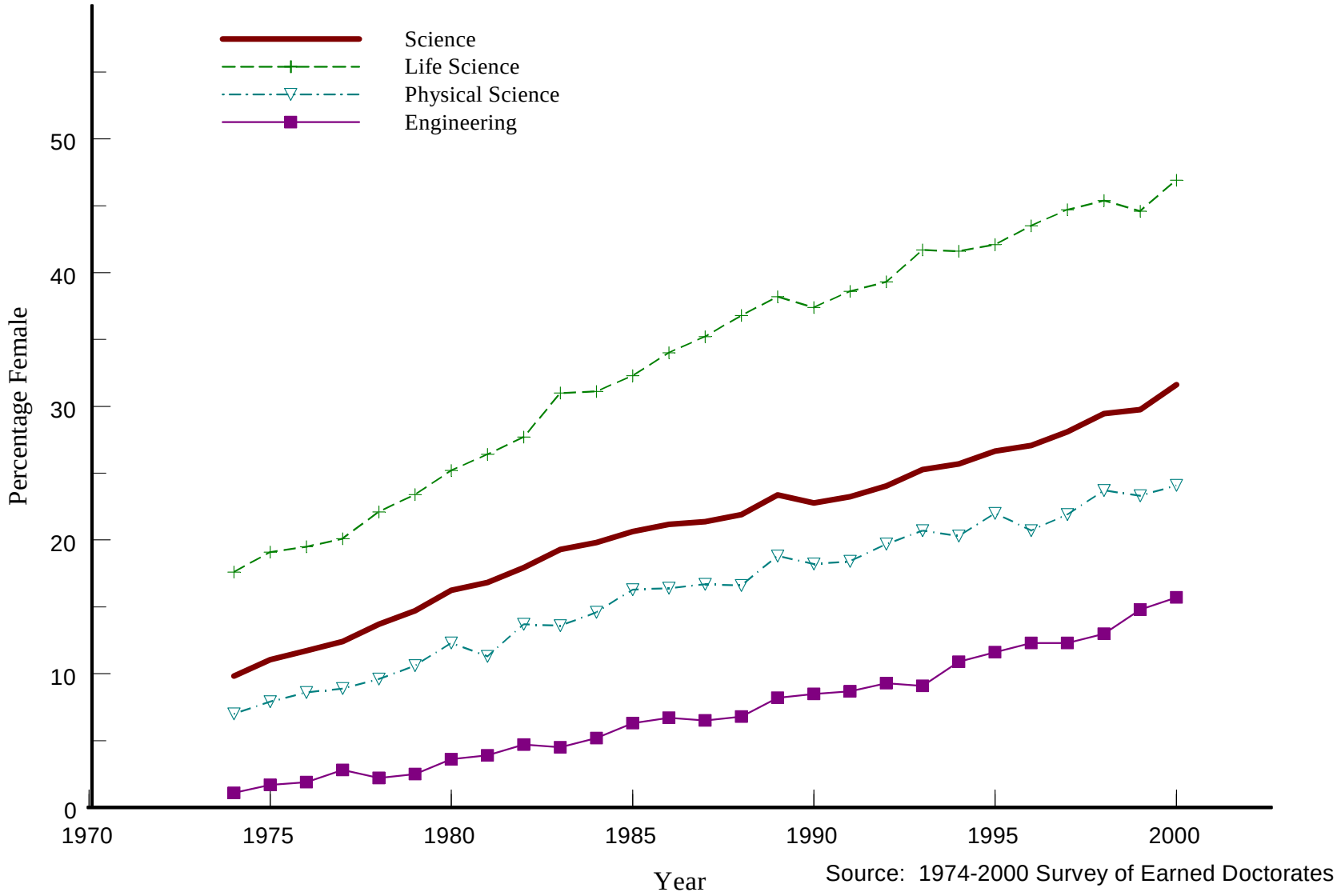
Empirical Methods

- Probit models (dependent variable):
  - Tenure track within 9 years of PhD
  - Tenured at 11 years after PhD
  - Tenured, Full Professor at 15 years after PhD

Stylized Facts

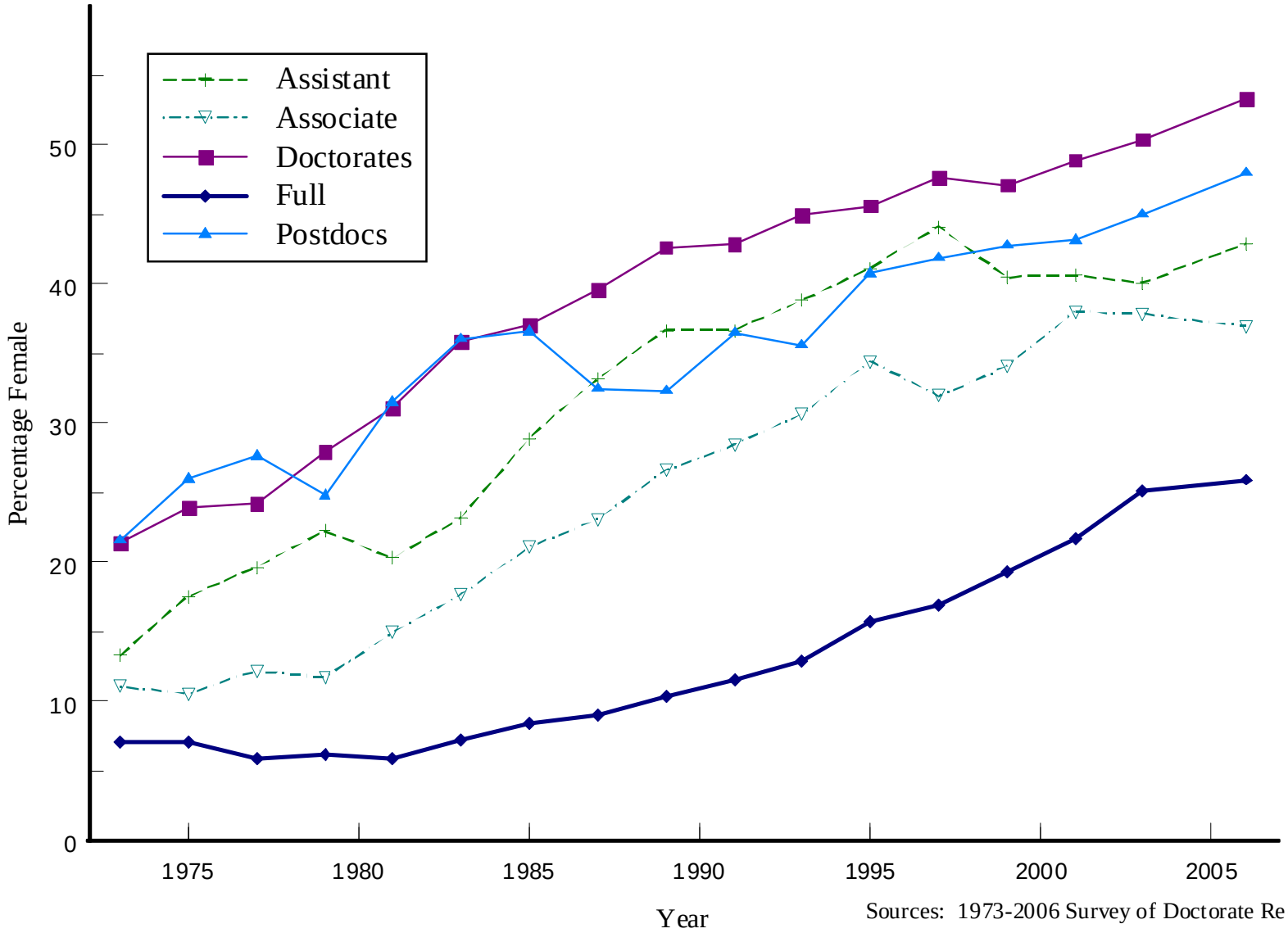
- Women's representation in science depends upon the field
  - Life Science—Progress
  - Physical Science, Engineering,—Anemic representation

Figure 1: Percentage of Doctorates Granted to Females, 1974-2000 Suvey of Earned Doctorates



Source: 1974-2000 Survey of Earned Doctorates

Figure 1: Percentage Female by Rank, Biomedical Science Disciplines 1973 - 2006



Sources: 1973-2006 Survey of Doctorate Recipients

1975 - 2006 Survey of Earned Doctorates

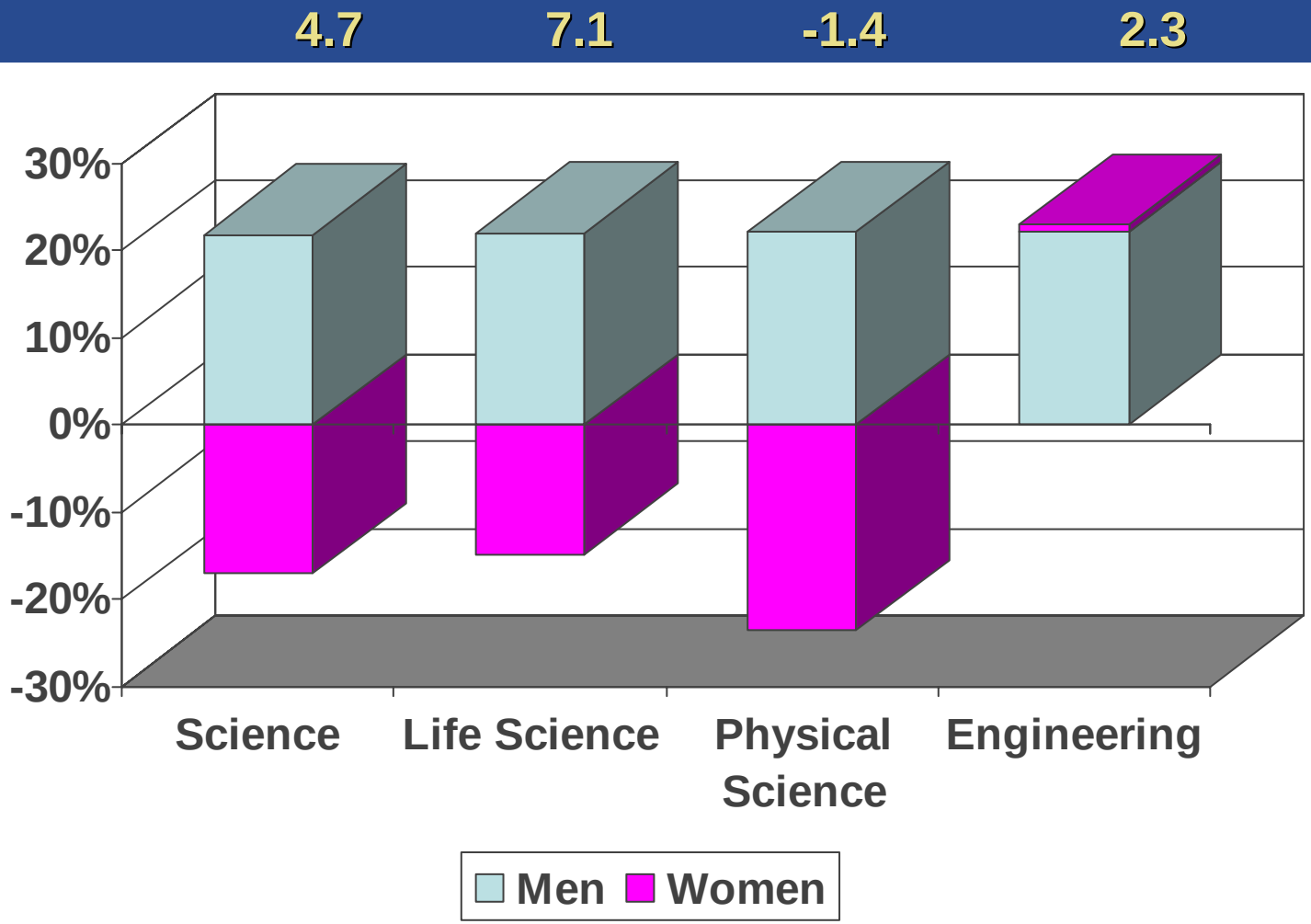
Postdocs in Biomedicine

- Part of the decrease in women in academic biomedicine is likely explained by not having a postdoc.
  - Why do women opt out of biomedical careers early in the process?

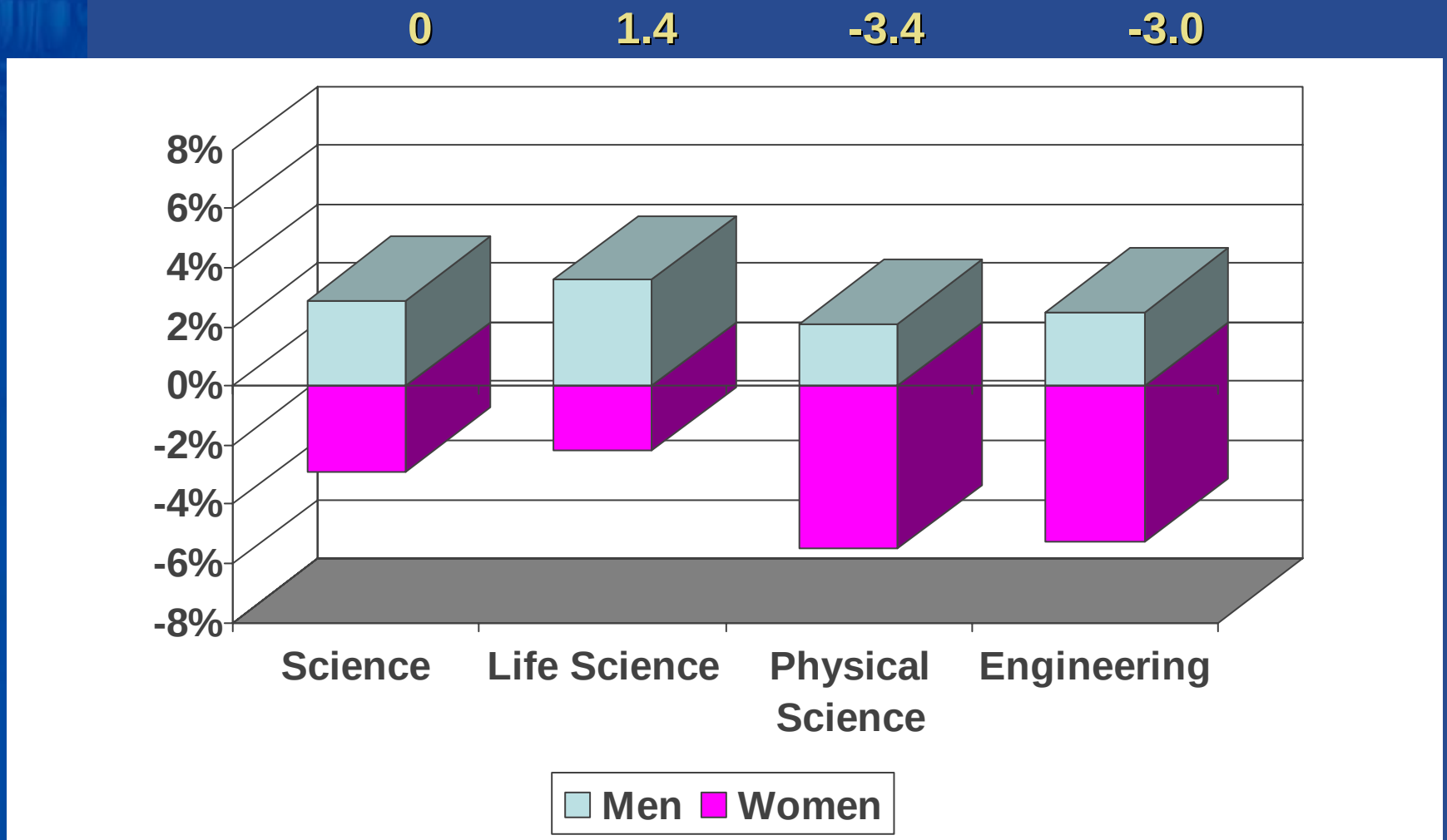
Female Probability of Tenure-Track Job 1973 - 2001

	Model 1	Model 2	Model 3
Science	-0.038	-0.033	0.156
	(0.009)	(0.010)	(0.018)
Life Science	-0.041	-0.077	0.108
	(0.012)	(0.013)	(0.025)
Physical Science	-0.002	-0.015	0.206
	(0.016)	(0.017)	(0.029)
Engineering	0.000	0.013	0.072
	(0.033)	(0.035)	(0.064)
Demographics	No	Yes	Yes
Degree Characteristics	No	Yes	Yes
Fields	No	Yes	Yes
Female Interactions	No	No	Yes

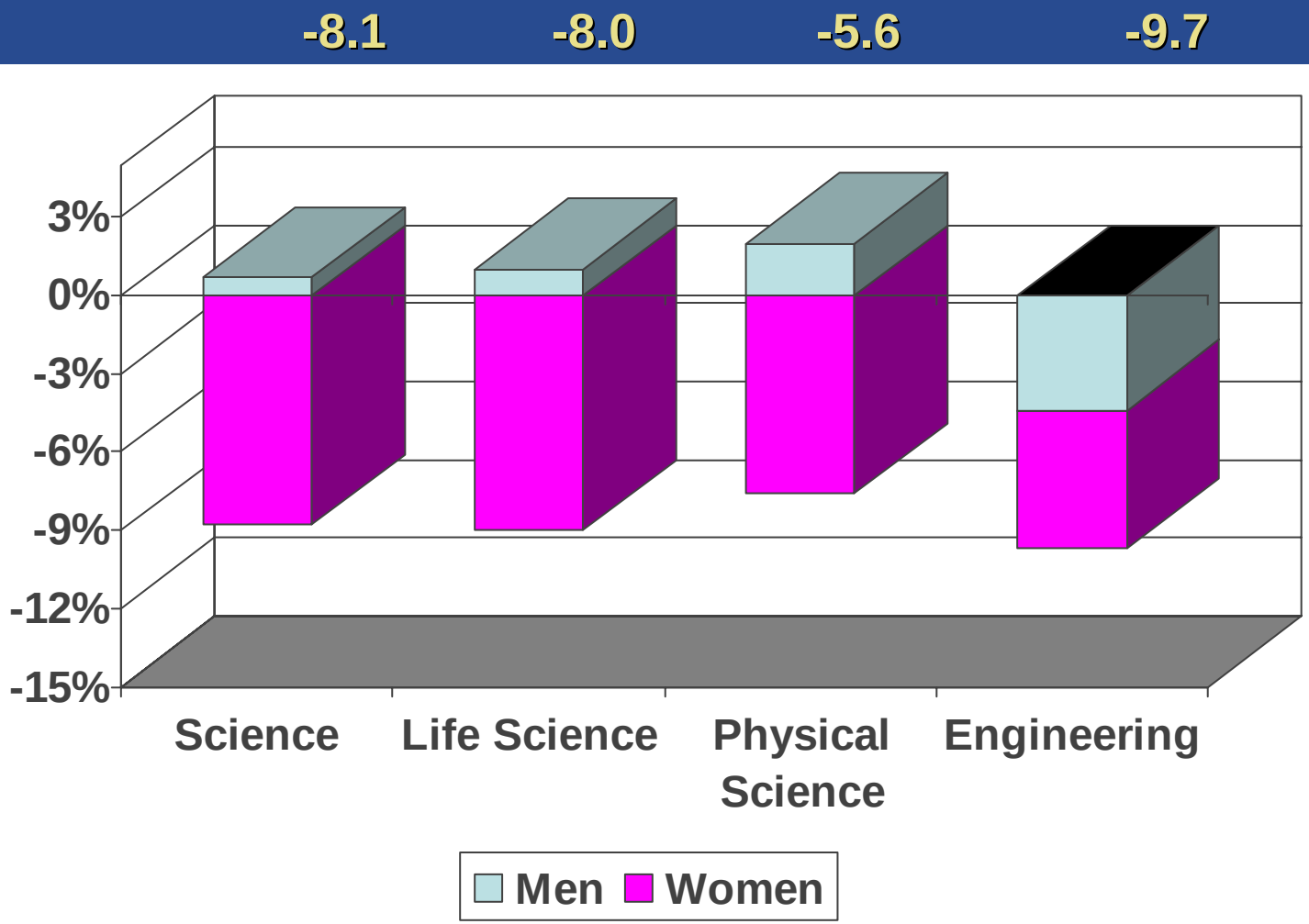
Effect of Marriage



Effect of Children



Effect of Young Children



Tenure Track Jobs in Biomedicine

- Updated the analysis for biomedicine using 1973-2006 SDR
- Very similar results:
  - Single women are 3 percentage points more likely to have tenure track jobs than men
  - Women with young children are 6.7 percentage points less likely to have tenure track jobs than men

Promotion to Tenure

	Full Sample	Life Science	Physical Science	Engineer-ing
Female Probit Coefficient	0.00	-0.03	0.01	0.02
Promoted 11 Yrs Ph.D.	(0.88)	(0.19)	(0.73)	(0.75)
Female Risk Ratio	0.97	1.02	1.00	1.06
(No Covariates)	(0.33)	(0.60)	(0.96)	(0.56)
Model 1 Female Risk Ratio	0.95	***0.89***	0.93	1.00
(Excluding Productivity)	(0.14)	(0.02)	(0.22)	(0.97)
Model 2 Female Risk Ratio	0.97	0.92	0.94	1.03
(Including Productivity)	(0.29)	(0.07)	(0.28)	(0.82)

Promotion to Full Professor

	Full Sample	Life Science	Physical Science	Engineering
Female Probit Coefficient	***-0.05***	**-0.09**	-0.02	0.09
Promoted 15 Yrs Past Ph.D.	(0.02)	(0.00)	(0.51)	(0.37)
Female Risk Ratio	**0.90**	0.96	**0.79**	0.95
(No Covariates)	(0.01)	(0.48)	(0.00)	(0.74)
Model 1 Female Risk Ratio	0.95	0.93	0.87	1.09
(Excluding Productivity)	(0.34)	(0.37)	(0.11)	(0.89)
Model 2 Female Risk Ratio	0.97	0.96	0.89	1.04
(Including Productivity Covariates)	(0.54)	(0.61)	(0.19)	(0.82)

Conclusions

- Does Science Promote Women?
  - **YES—once they're on the tenure track**
- Gender differences in tenure track
  - Explained by differences in family at the time of the postdoc.

Future Research Questions

- We show that family considerations at the time of the postdoc affect the probability of taking a tenure track job.
- WHY?
  - Job matching
  - Differences in productivity
  - Choices
  - Institutions

Philosophical Question

What is the nature of the postdoc?

- Is it an investment in training and human capital?
  - If so why do women choose to forgo this investment?
- Or is it an unproductive queuing mechanism for research jobs?
- Or a bit of both?