Social and Economic Perspective

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NIGMS

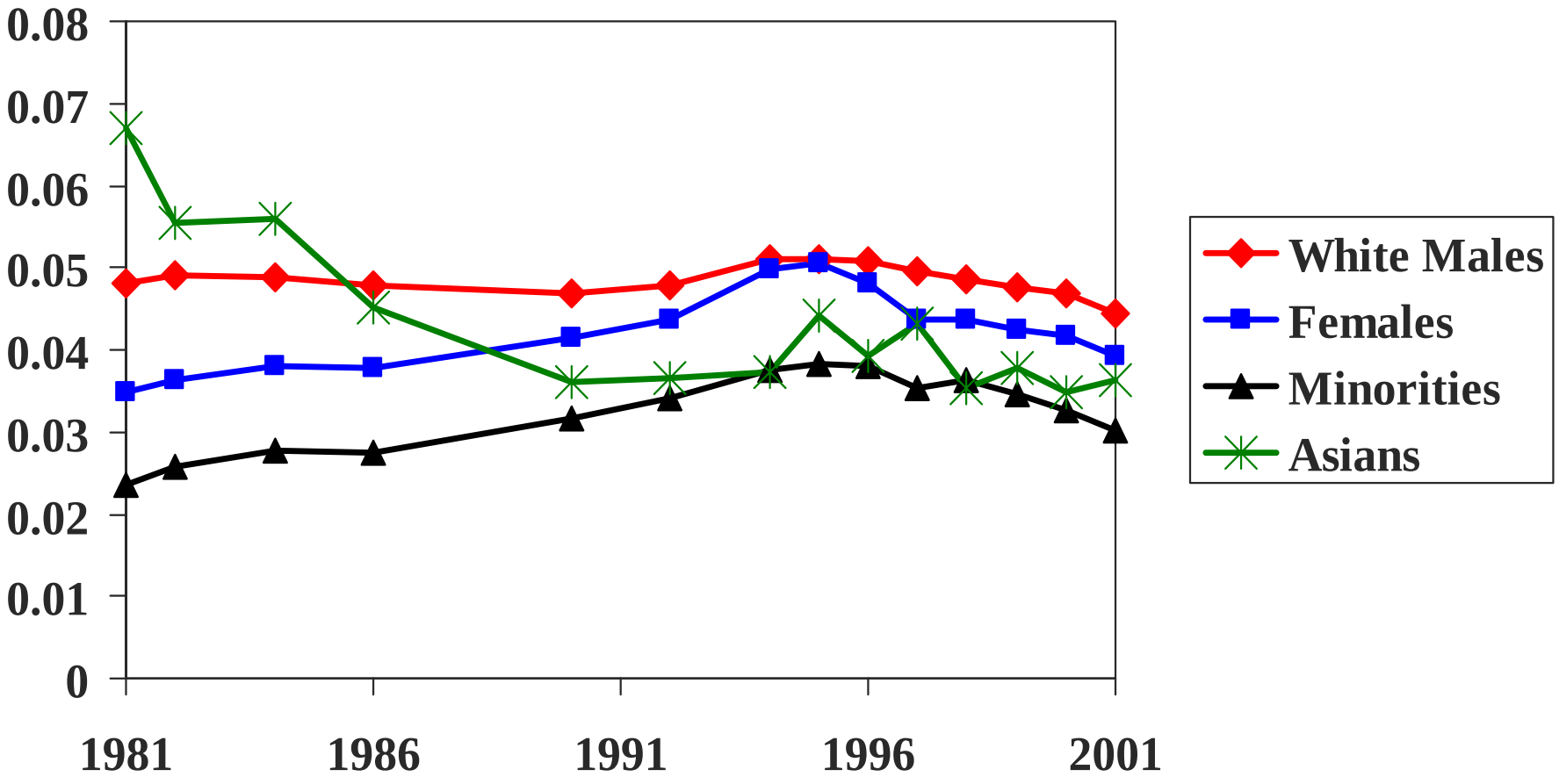
Points to stress/caveats

- Recruitment and Retention are Important
- Economic Variables play a role
- Thank Richard Freeman for sharing several slides
- Portion of presentation uses data from Survey of Doctorate Recipients. Use of data does not imply NSF endorsement of research methods or conclusions.

Recruitment

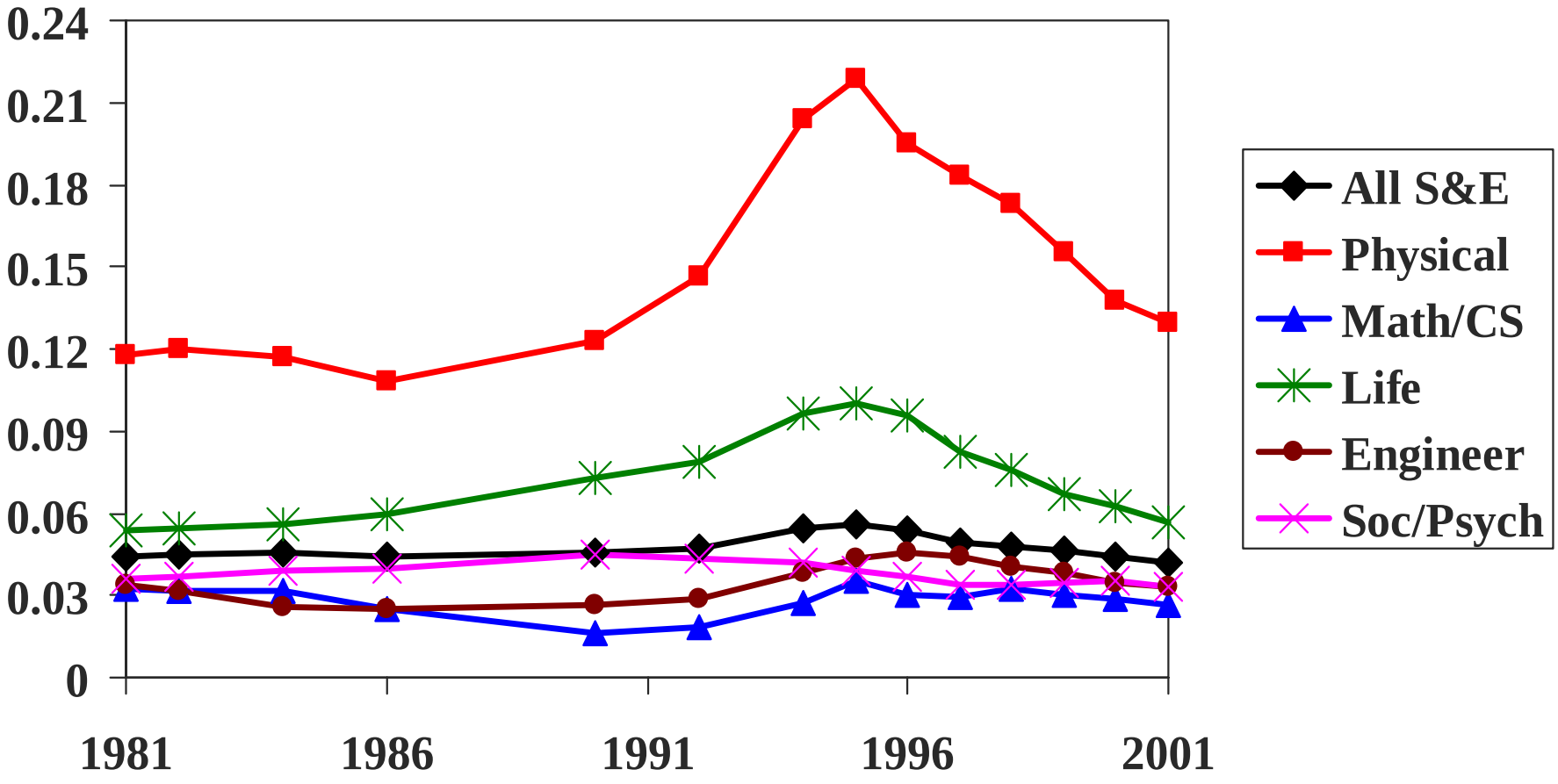
- Growth of URM in S&E has been largely driven by growth in Bachelors Degrees. (Same has been true for women).

Ratio of Doctorates to 5-Year Lagged Bachelor's Degrees in S&E: By Demographic Group



Source: Freeman's tabulations from data obtained from the Survey of Earned Doctorates and the U.S. Department of Health, Education, and Welfare.

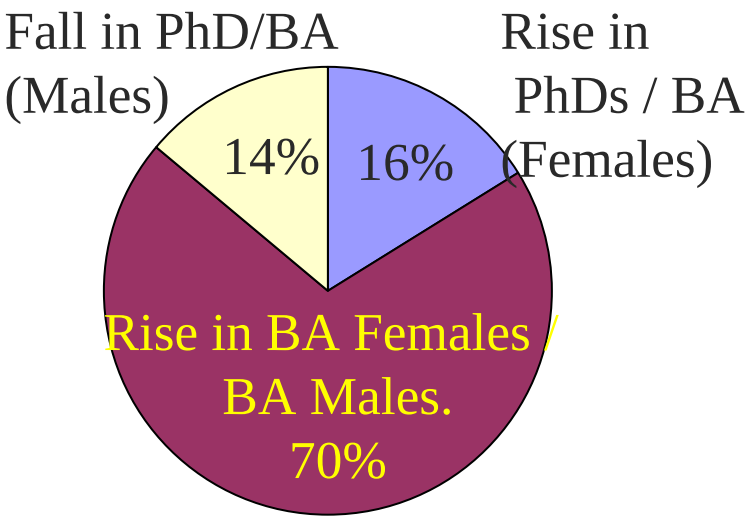
Ratio of Doctorates to 5-Year Lagged Bachelor's Degrees: By Field



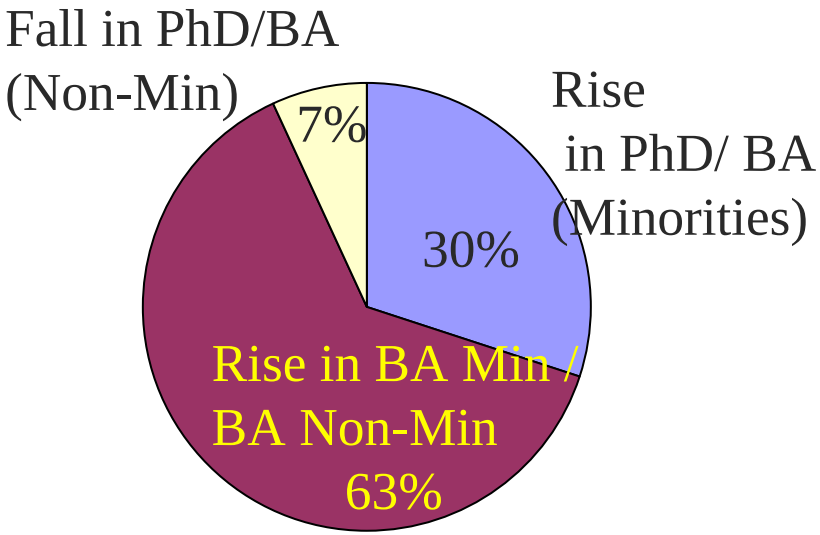
Source: Freeman's tabulations from data obtained from the Survey of Earned Doctorates and the U.S. Department of Health, Education, and Welfare.

2.3 Decomposition of 1981-2000 Change in F/M and Minority/ Majority Ratios among PhD Recipients (ln units)

Change in
Female/Male PhDs
= 0.74, explained by:



Change in
(Min/Non-Min PhDs)
= 0.82, explained by:



BA data lagged by 5 years compared to PhD data
Min: Underrepresented Minority

Recruitment

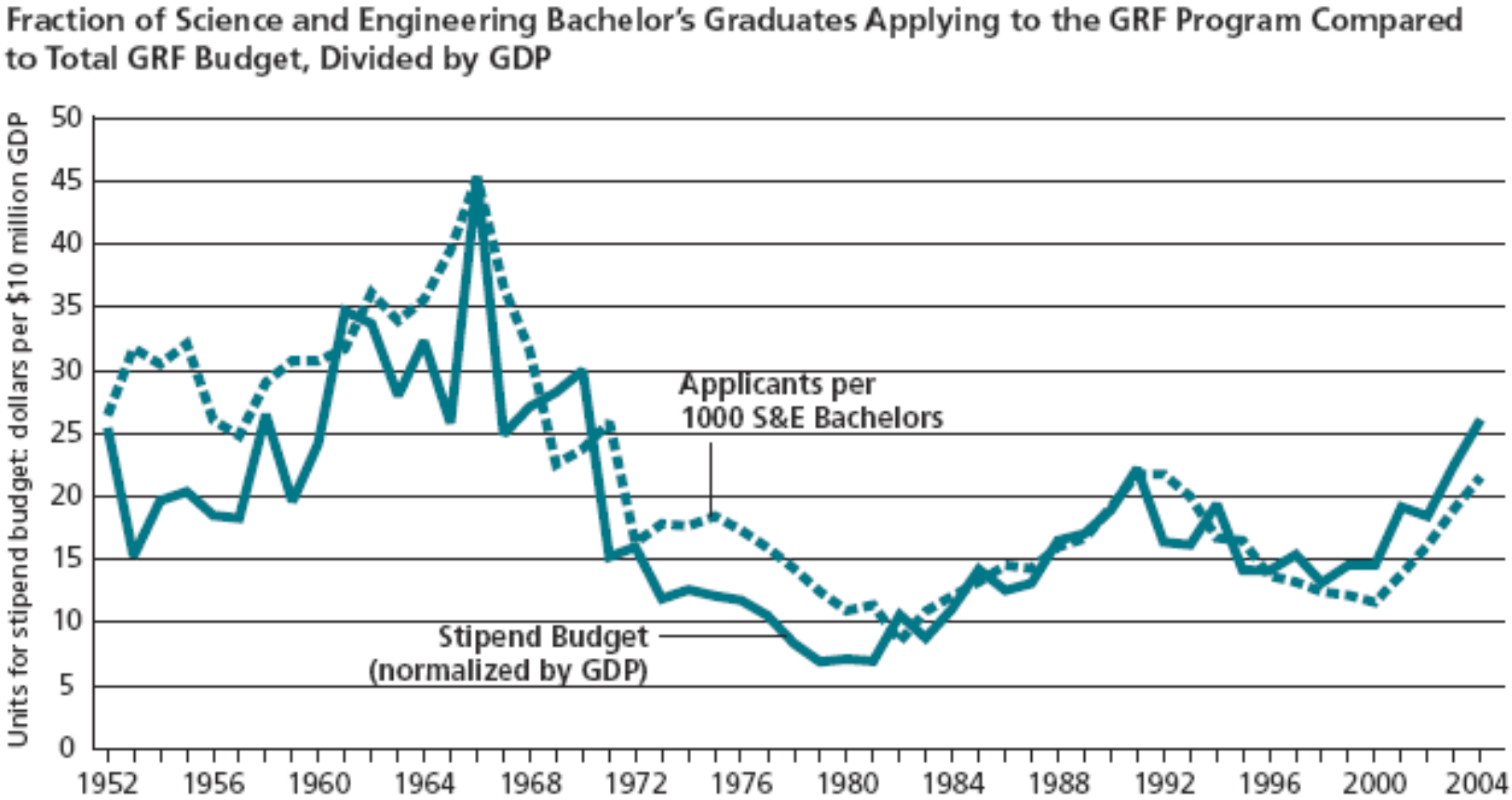
- Data suggest that growing the number of BAs is important in growing the number of URM PhDs and changing the ratios
  - Policies that affect number of URM-BAs important
- Economic variables also play a role
  - Overall economy
  - Value of fellowships relative to other economic variables
  - Length of training
  - Returns to alternative occupations

Determinants of the Number of GRFP Applicants, 1969-2004

	Dep Var: ln(applicants in academic field in current year)			
	(1)	(2)	(3)	(4)
Log(Bachelor's Degs) by Field in Current Yr	0.195	0.304	0.298	0.516
	(0.057)	(0.063)	(0.062)	(0.066)
Log(Stipend/Outside Salary) in Previous Yr	0.996	0.916	0.852	0.772
	(0.084)	(0.060)	(0.059)	(0.056)
Unemp Rate for College Grads Age 21-25		0.049		
		(0.013)		
Unemp Rate for All College Grads			0.104	0.094
			(0.024)	(0.022)
Log(Awards/Bachelor's Degs) by Field in Previous Yr				0.349
				(0.054)
Field Effects	Yes	Yes	Yes	Yes
Field x Time Trend	Yes	Yes	Yes	Yes
Observations	324	234	234	234
R-squared	0.8931	0.955	0.9561	0.9634

Source: NSF, Division of Graduate Education, Cumulative Index of the GRF Program and related datasets, as described in text. Outside salary are earnings of college graduates aged 21-25. Outside salaries and unemployment rates from Current Population Survey. Richard Freeman.

What Determines Number of applicants to NSF?



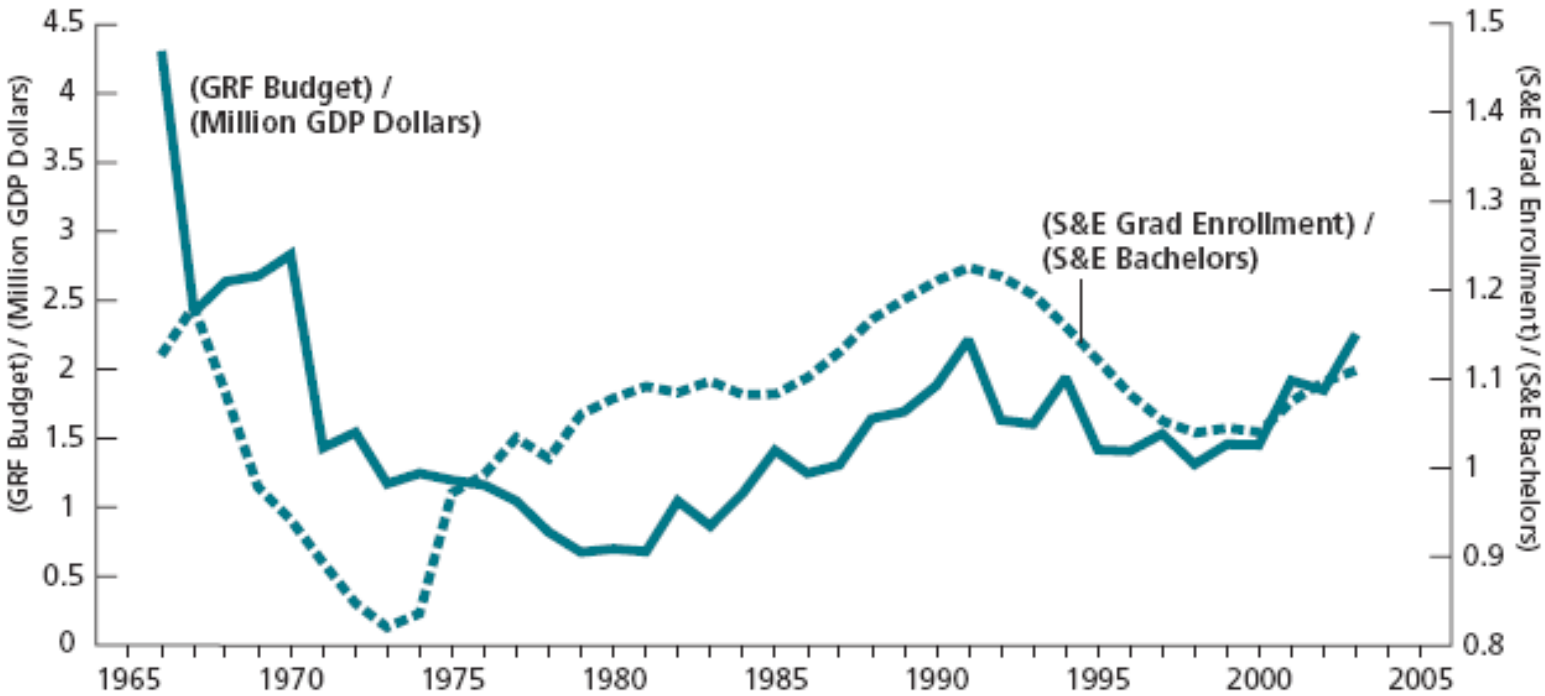
Sources: NSF-DGE various years, cumulative index of the GRF program and related data sets. Data on the GDP from the Bureau of Economic Analysis.

Does Fellowship Program affect total supply?

- Depends on impact on other fellowships
- When NSF doubled stipends universities and others followed suit, so going rate rose toward the $30k

Does Fellowship Program Affect Overall Supply?

Fraction of Science and Engineering Bachelor's Enrolling in Science and Engineering Graduate Programs Compared to Total GRF Budget, Divided by GDP



Source: GRF budget divided by GDP, as in Exhibit 5a; bachelor's graduates in science and engineering, as in Exhibit 5a. Enrollments in science and engineering graduate programs from NSF graduate students and postdoctorates in science and engineering (NSF 2004).

Length of Training Affects Attractiveness of Career Choices

- Graduate school/post doc position take 10 to 11 years. This represents up to 25% of the work life of an individual
- "Front loaded." It counts more because of discounting
- Simple example: $15,000 fellowship in real terms; $60,000 salary in real terms after graduation
- Present value of career earnings is $1,716,119 using very conservative real discount rate of 1%.
- If one had not attended graduate school and found a career that paid $60,000 present value would be $2,187,276.
- Scientists gets 78% of the other.
- With higher interest rate, difference increases: 74% at 2%.

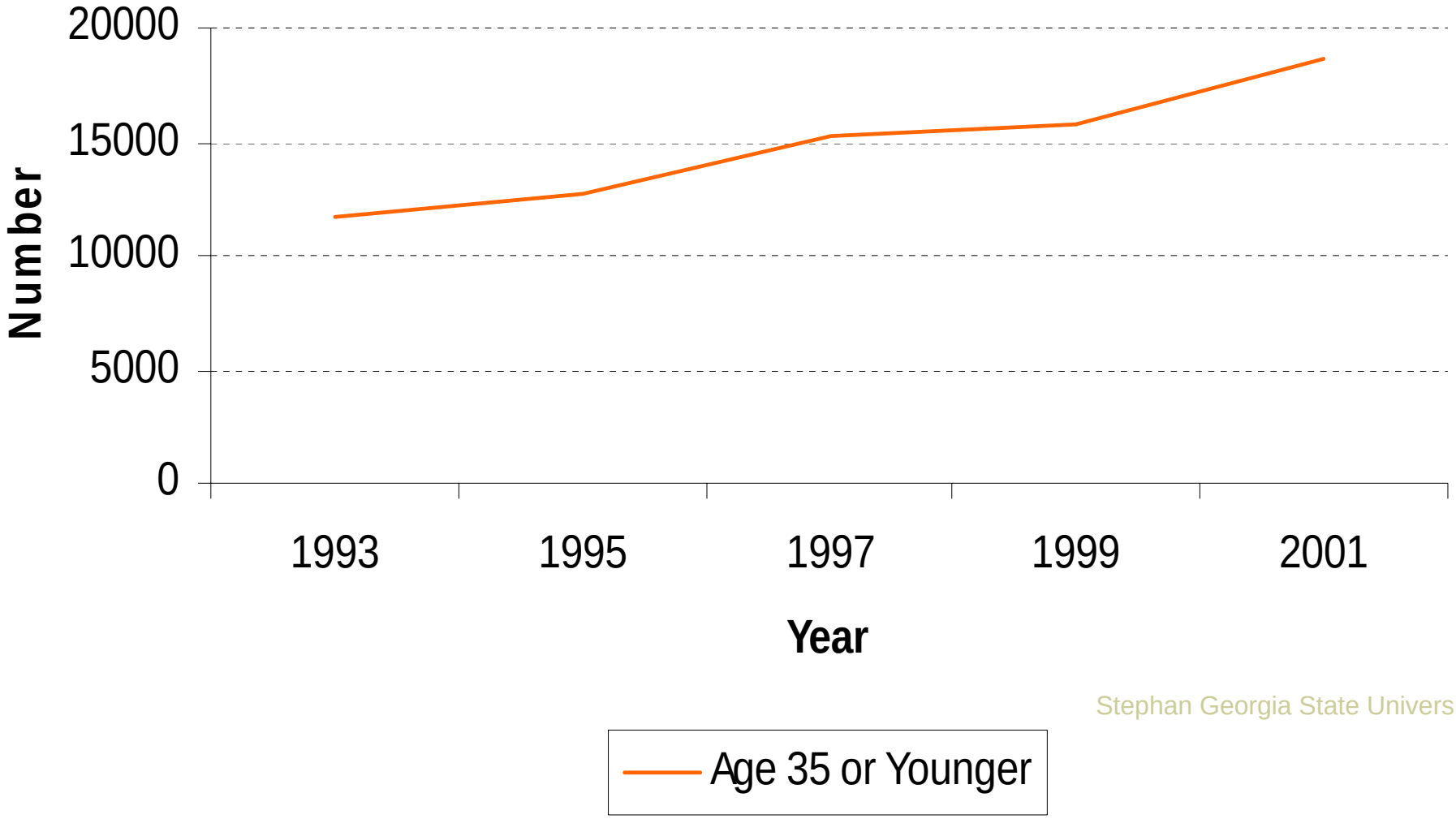
Length of Training May Have Bigger Impact on Minorities

- Different options at time of graduation for professional school and other types of jobs
- Different financial obligations—debt coming into graduate school

Just how appealing are careers in the life sciences?

- Probability of getting a tenure-track position
- Probability of getting R01 funding
- Probability of funding continuing
- How these have changed over time

Biomedical Ph.D.s Age 35 or Younger



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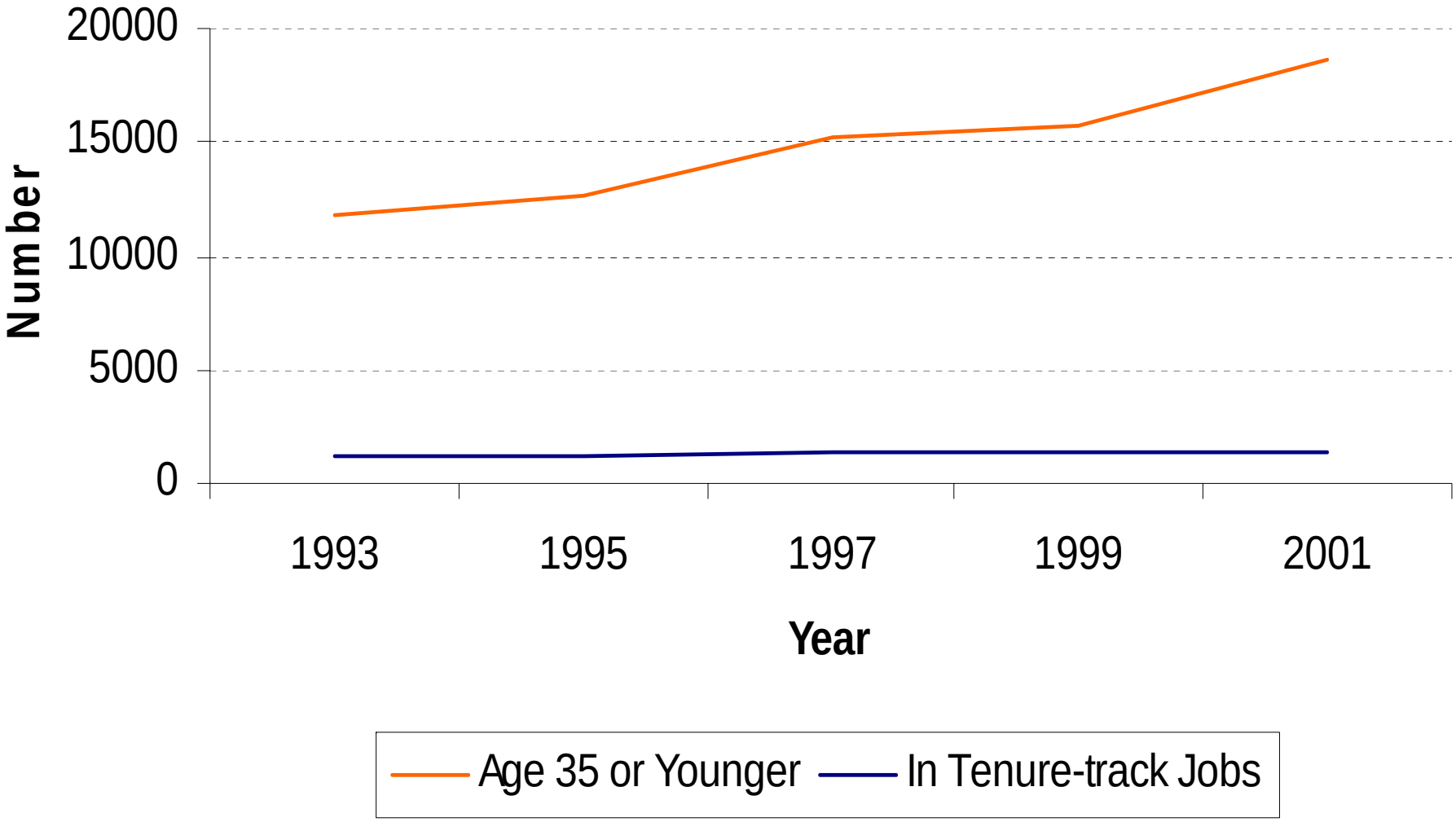
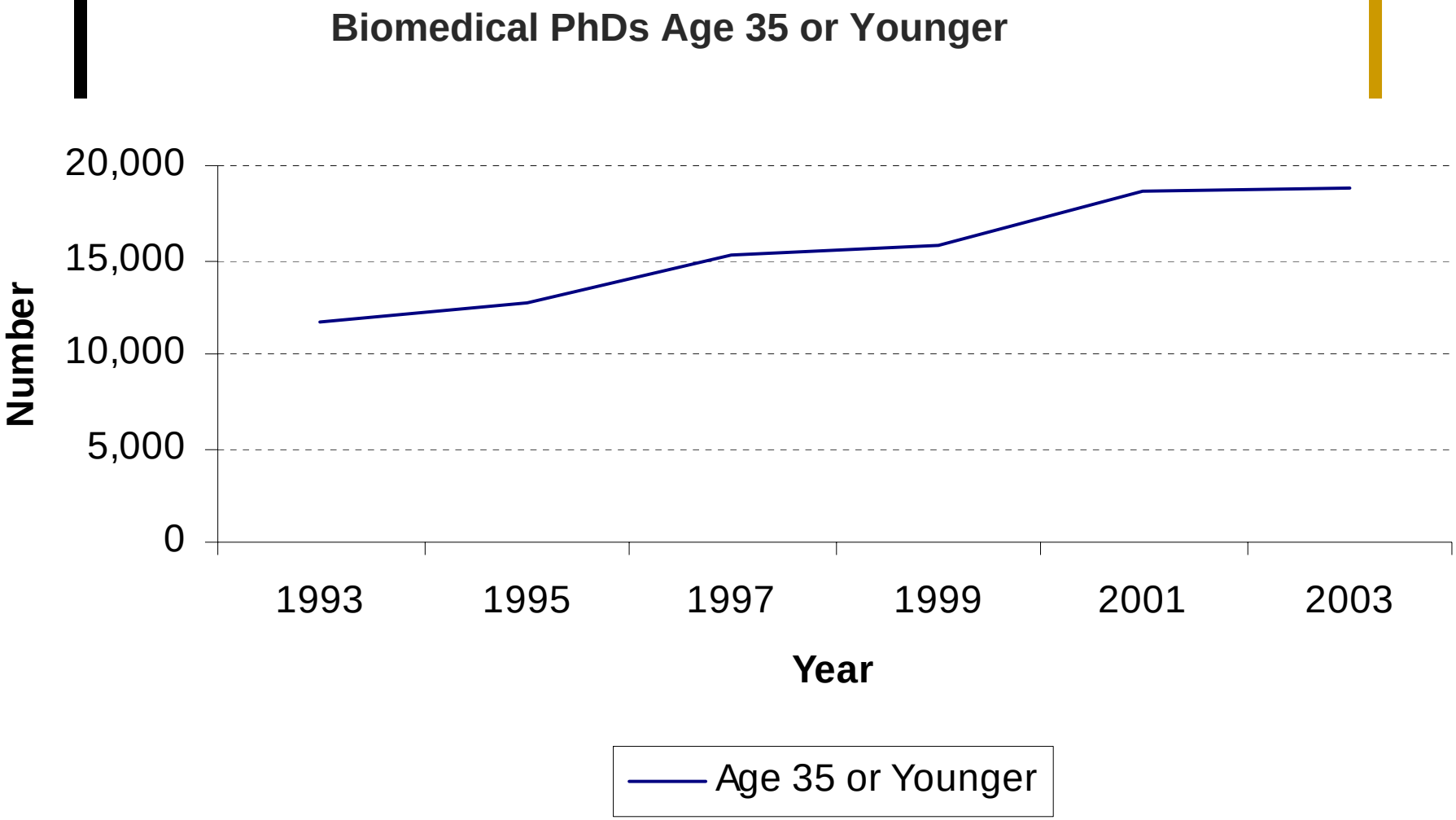
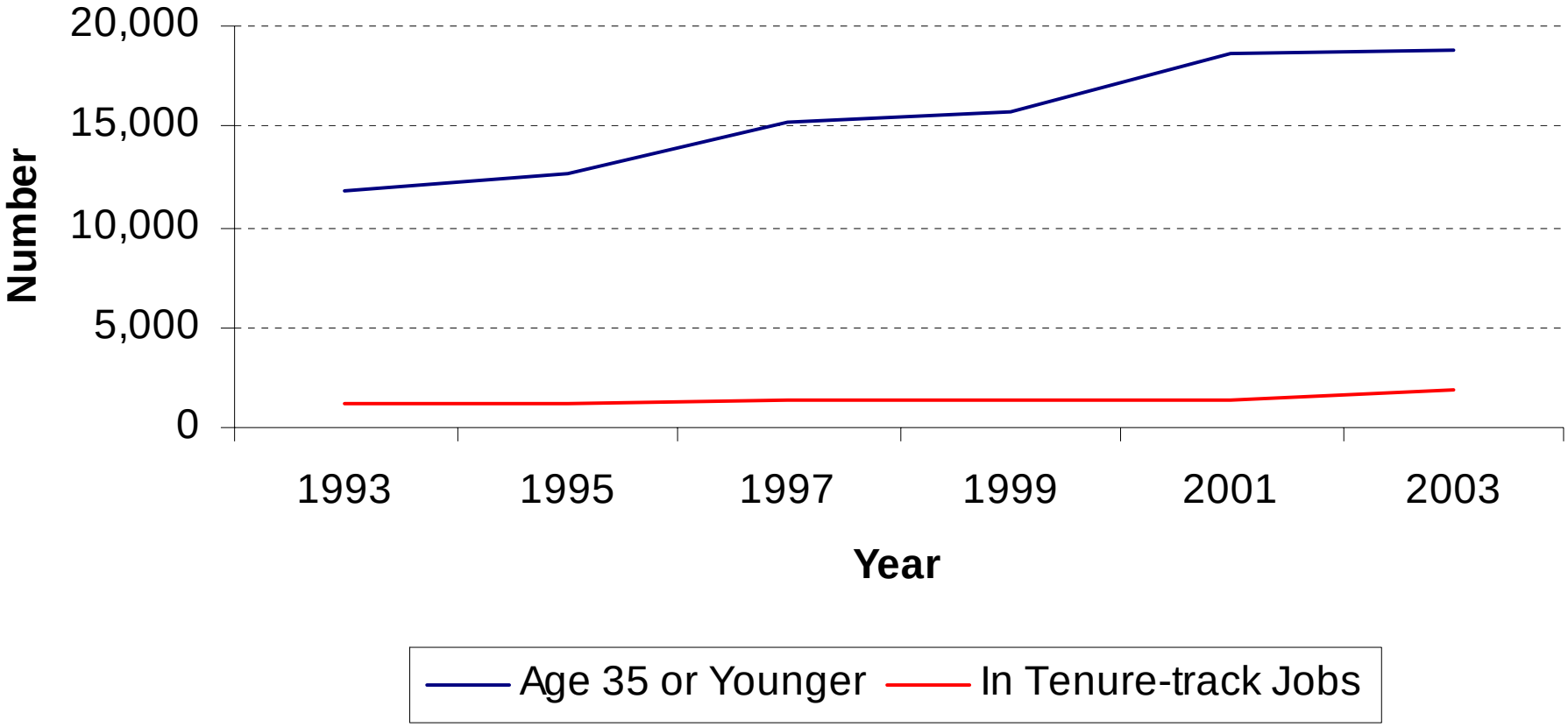


Data show that

- Number of life scientists 35 or under had grown considerably during 8 years: 11,715 to 18,671 (59%)
- Number of life scientists 35 or under in tenure track positions had remained almost constant: 1212 to1294 (7%)
- *Conclude: probability that a young person trained in biomedical life sciences held a tenure track position had declined considerably during the 8 years: 10.3 % to 6.9%*


Biomedical PhDs Age 35 or Younger
20,000
15,000
10,000
5,000
0
Number
1993
1995
1997
1999
2001
2003
Year
Age 35 or Younger

Biomedical PhDs Age 35 or Younger

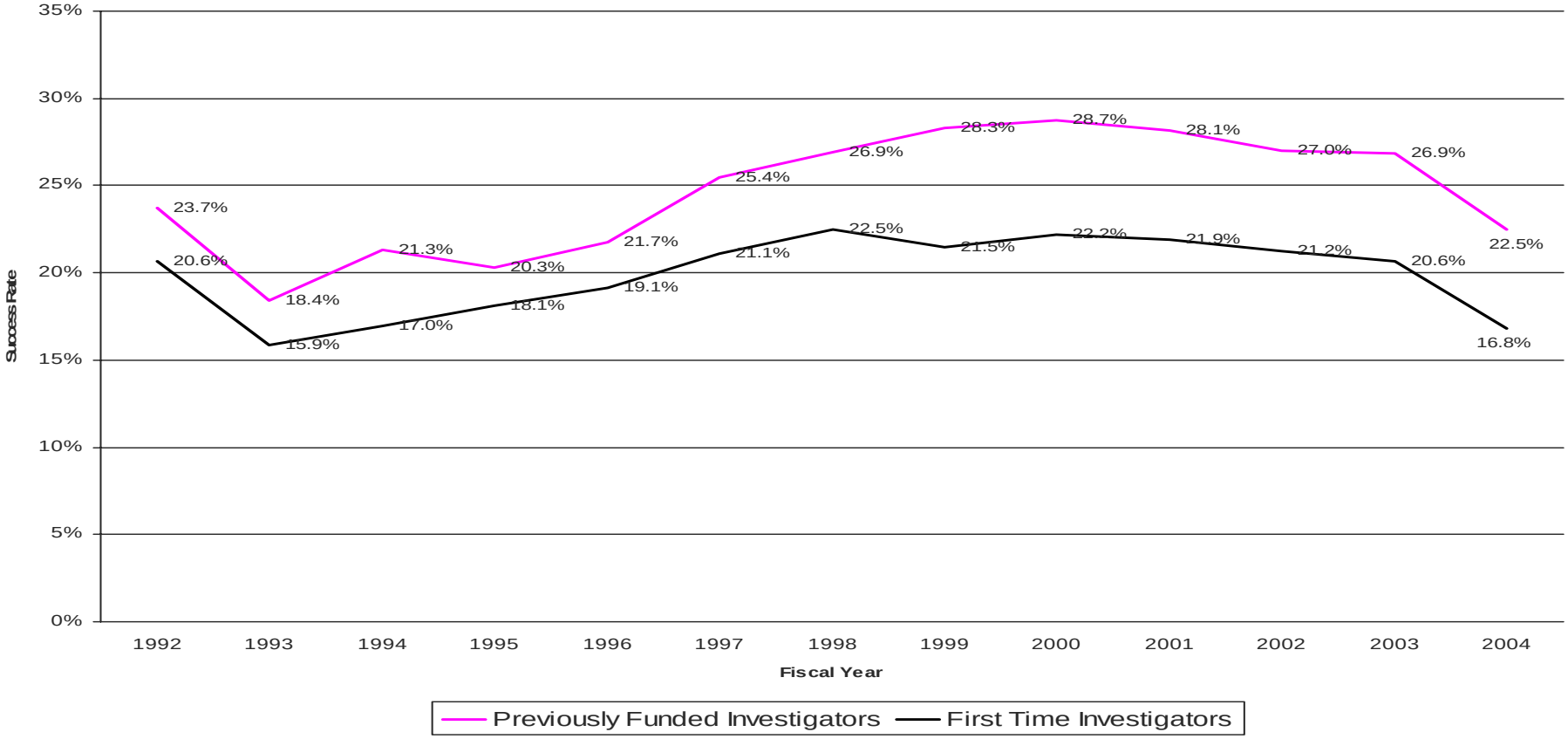


Conclude

- *Probability that a young person trained in biomedical life sciences holds a tenure track position is about the same in 2003 as it was in 1993: 10.3 % to 10.4% (or from 6.9% in 2001).*
- If we include non-tenure track, 13.7% to 14.4% over ten year period (or from 9.7% in 2001).
- At Research I, 5.3% to 5.2% (or from 4.4% in 2001).

NIH New (Type 1) Competing R01 Equivalent Applications

Success rates for first time and previously funded investigators



R01 Equivalent = R01, R29, and R37 activities.

NIH, OER for GREAT

Probability of Funded tenure-track Career Conditional Upon having received a PhD

- 6.9% * 22.0%(2) about 3% 2001 (multiplied success rate by 2 to reflect “resubmissions”)
- 10.3%*17.0(2)%=3.5% in 2003 (multiplied success rate by 2 to reflect “resubmissions”)
- Conclude: even in “best of times” with NIH doubling, career prospects are bleak for young life scientists
- Add probability of receiving continuing funding and it is even bleaker
- Negative signal

Retention

- Do individuals remain in S&E occupations?
- Do URM-PhDs who remain in S&E work in positions in academe?
- Do URM-PhDs work in research positions (outside of academe)
- Do URM-PhDs work in policy positions?

Results from IT study

- Retention in IT varies by gender and minority status.
  - Women have a lower retention rate then men;
  - Underrepresented minorities have a lower retention rate than whites.
- A sizeable proportion of IT-trained women who are not working in IT jobs are out of the labor force.
- In contrast, a sizeable proportion of IT-trained African Americans who are not working in IT are working in non-IT jobs.
- “Pushed or Pulled?” Difficult to know but some become managers;
- Marriage and family play different roles by race/ethnicity. For example, there is no indication that the presence of young children affects retention among African Americans. Not the case for Hispanics.: Presence of children predisposes women (but not men) to be less likely to work.

Questions to answer

- What policies promote increase in proportion of URM's getting BAs in science and engineering? Which programs are most effective: VERY IMPORTANT—biggest effect could come here. Simulate various scenarios.
- What policies promote increase in completion of PhD?
- What policies promote increase in post-doc taking rate of URM's—important if goal is to place more URMs in tenure-track positions
- What policies promote movement to academe from postdoc?
- Is switching to a medical track a "poor" outcome?
- What characterizes those who leave careers in S&E?

Data available

- National Survey of Recent College Graduates could be used to answer some of these questions
- Survey of Doctorate Recipients can be used to answer retention questions
- Survey of Earned Doctorate can be used to answer time to degree questions
- But clearly need for more data: need to follow-up on participants in NIH funded programs, for example.
- Investigate using NRC data on postdoc programs that NRC administers
- Input on NSF-planned postdoc survey

Questions/comments

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