STEM ENROLLMENTS AFTER SPUTNIK CAME DOWN

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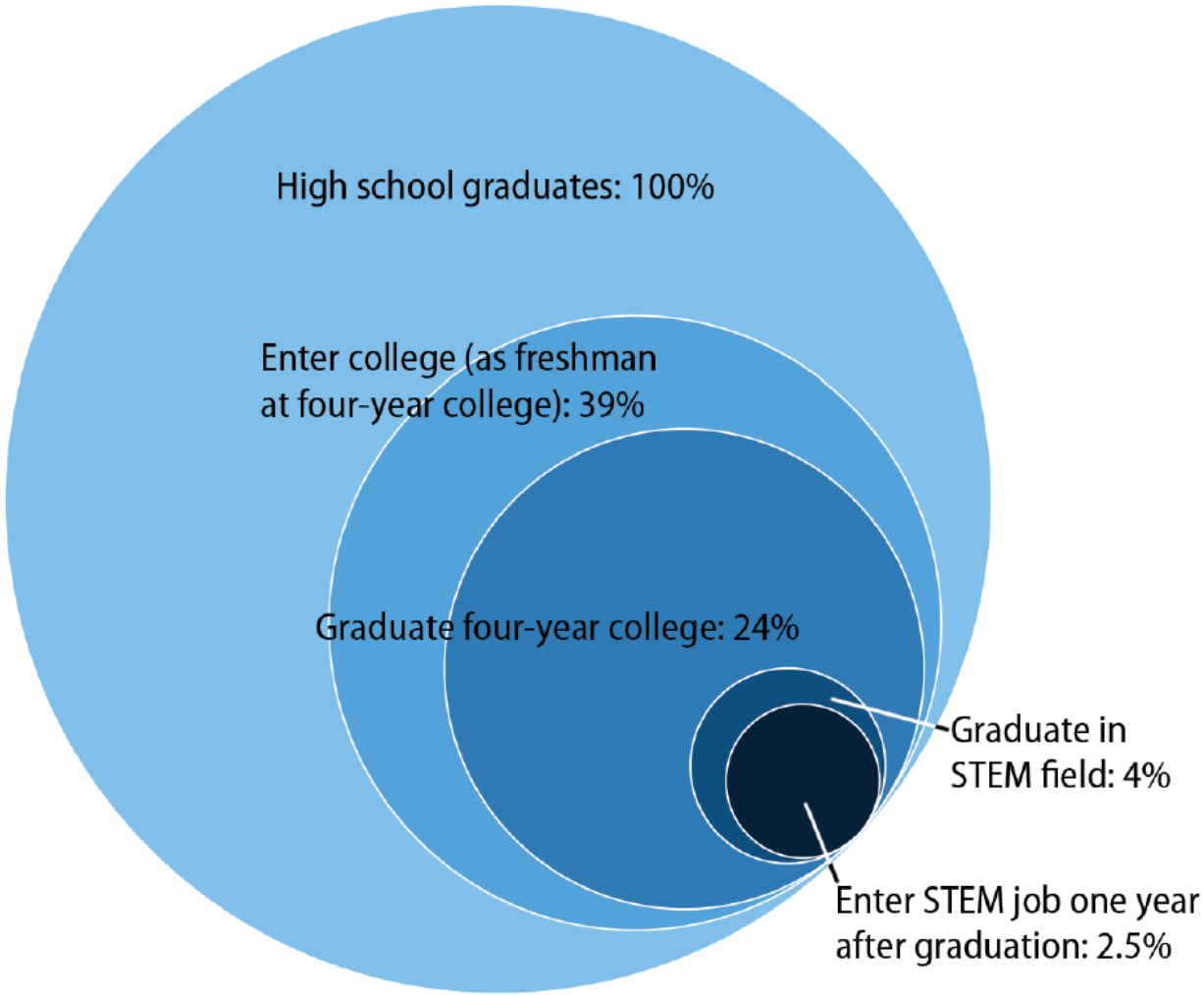
Keep the STEM workforce in perspective

- **The pipeline feeding into STEM jobs is very much bigger than the STEM workforce, and**
  - the number of students needed to be highly proficient in STEM skills is rather small;
  - most students would benefit from some STEM knowledge, but that's not a workforce issue.

- **Many STEM degree holders work outside of STEM, but**
  - expanding the definition of "STEM" into other jobs is a shell game (and at least very inefficient);
  - if STEM workers aren't working in STEM either there are surplus workers or STEM jobs loose their attraction.

FIGURE A

Percent of high school graduates going to college, graduating, and then entering a STEM job



Source: Authors' analysis of National Center for Education Statistics (2009b, 2013)

STEM education can be improved & diversified, but its not *broken*

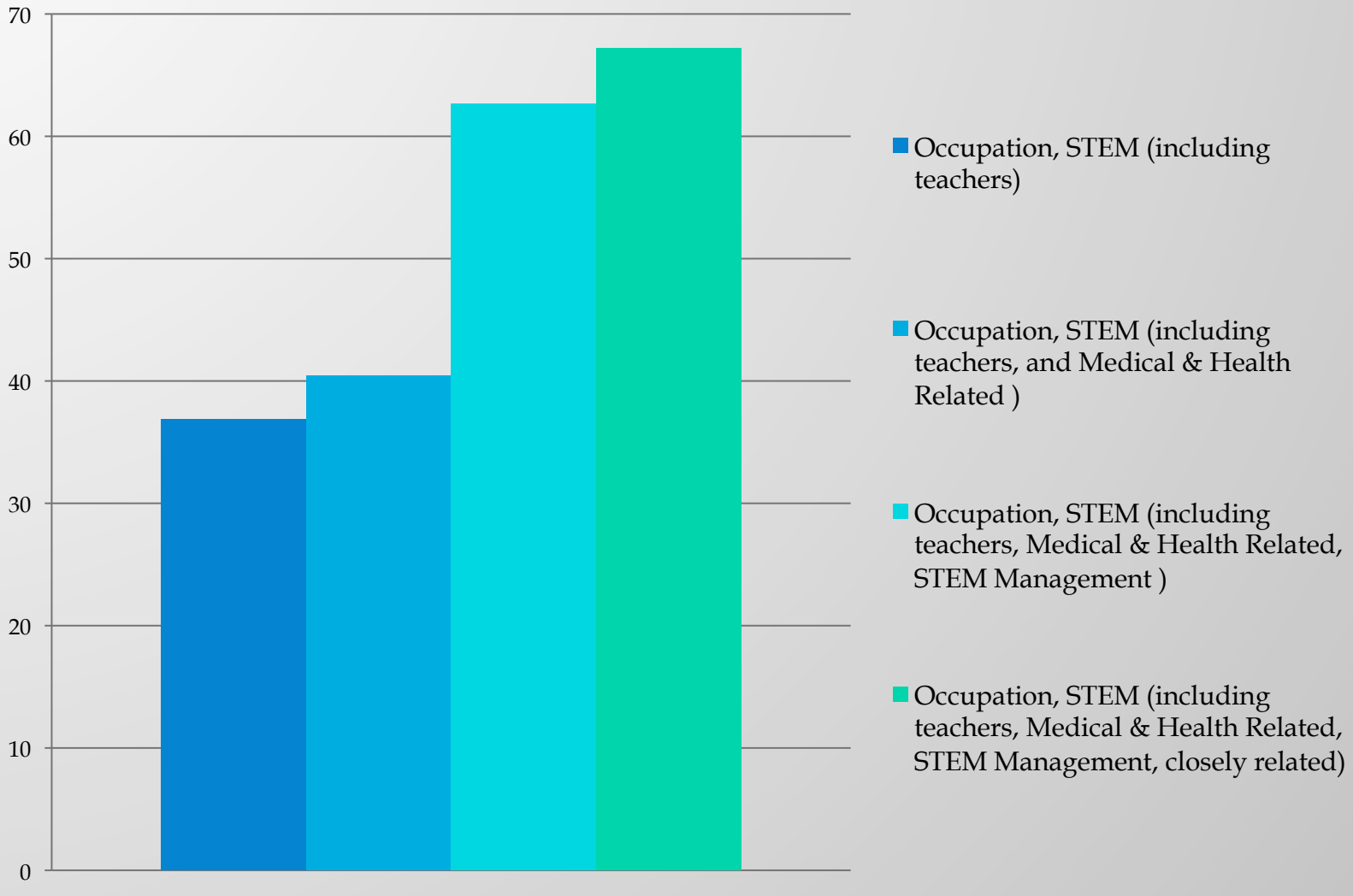
- **High school course taking up** – 75% of high schoolers complete algebra II/ trigonometry (up 50% since 1990); big increases in courses on calculus & sciences (NCES)

- **STEM interest steady/up** – since 1972 about 33% of college freshmen planned to study S&E; now 38% (NSF)

- **College attrition normal**—about half of BS STEM candidates leave before completing a college degree; roughly the same as other fields (NCES)

- **Domestic graduates up** – 2000-2009 increases:
  BS 27%, MS 35%, PhD 43% (NSF);
  enrollments appear to be edging up further (ACM)

STEM BS+ graduates in STEM + Medical + Management + Closely related occupations, % 2003

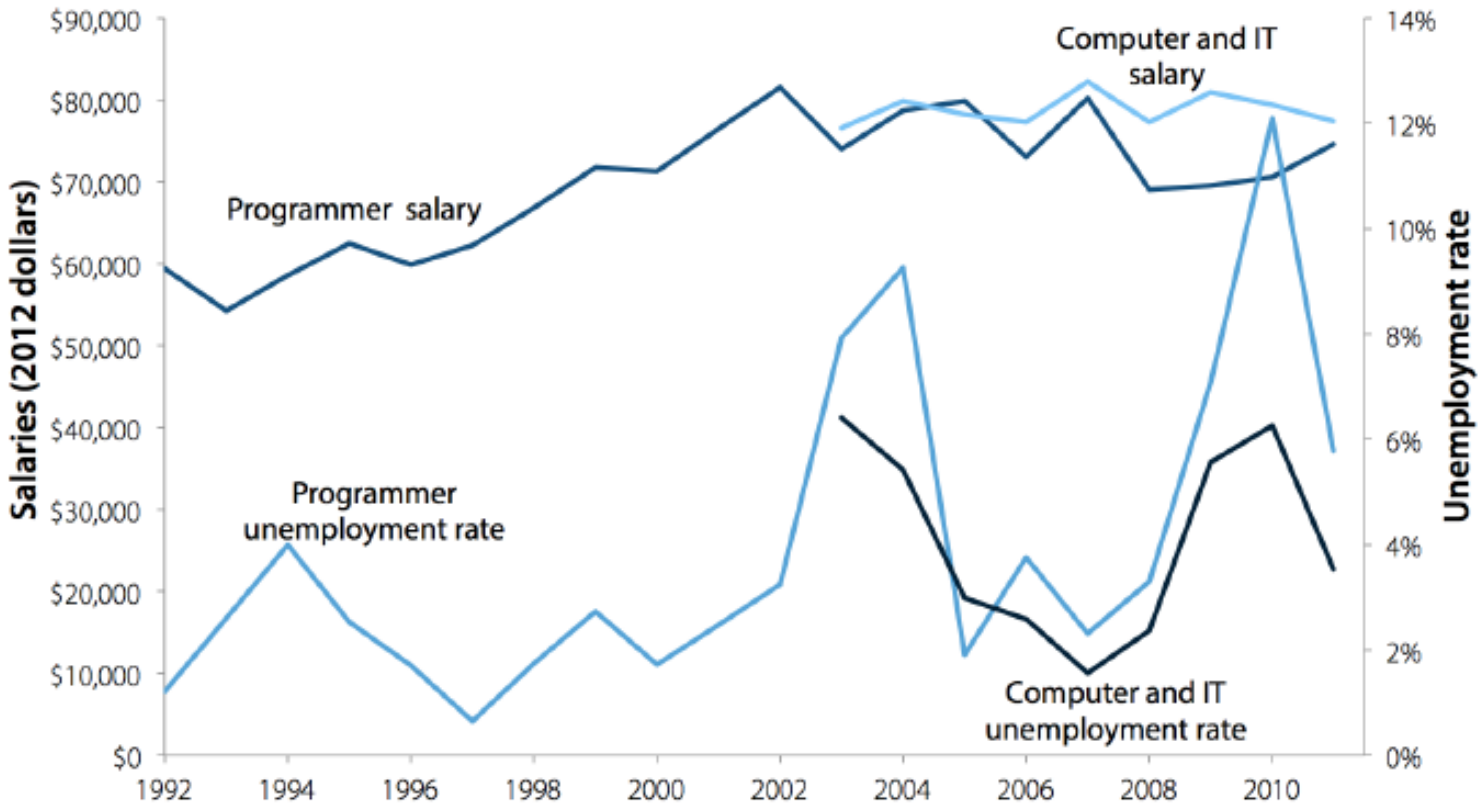


STEM workforce growth is robust, but not booming

- STEM job growth not robust, BLS tends to over project actual STEM employment
  - no computer or large STEM occupations projected in the top 30 fastest growing jobs to 2020 (BLS)
- About half of STEM graduates land a STEM job
  - IT and engineering - 50% more graduates than hires
  - CS grads *not* hired – 32% say IT jobs unavailable, 53% say better jobs elsewhere (NCES data)
- Demand in information technology is not what it was, wage growth is flat & unemployment relatively high

FIGURE I

Average salaries and unemployment rates for computer and IT occupations, 1992–2011

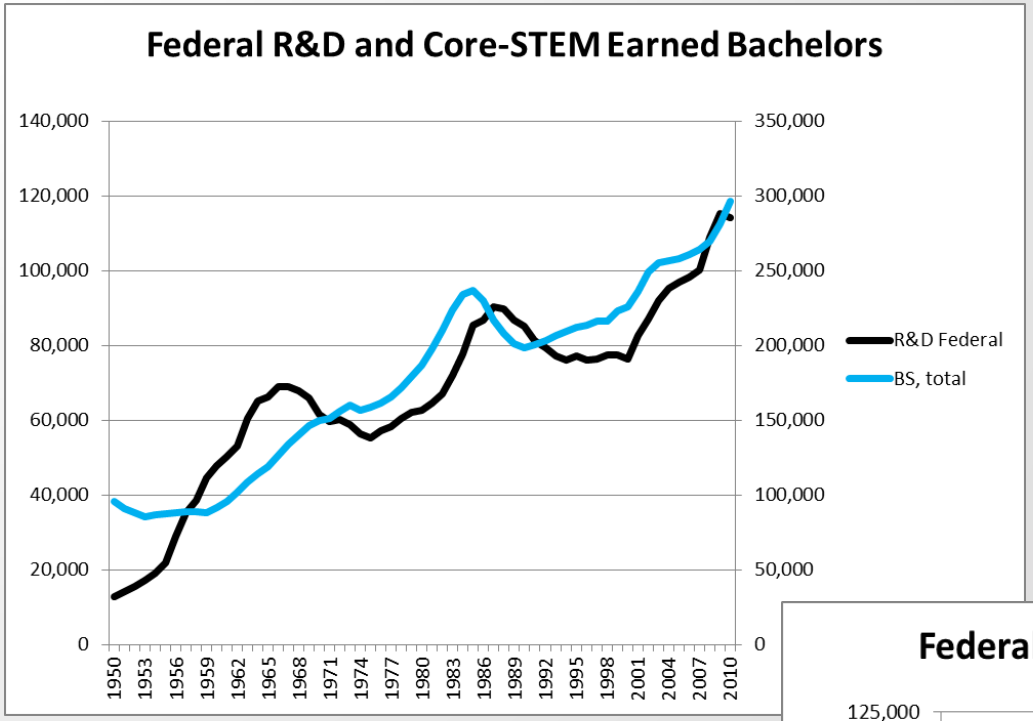


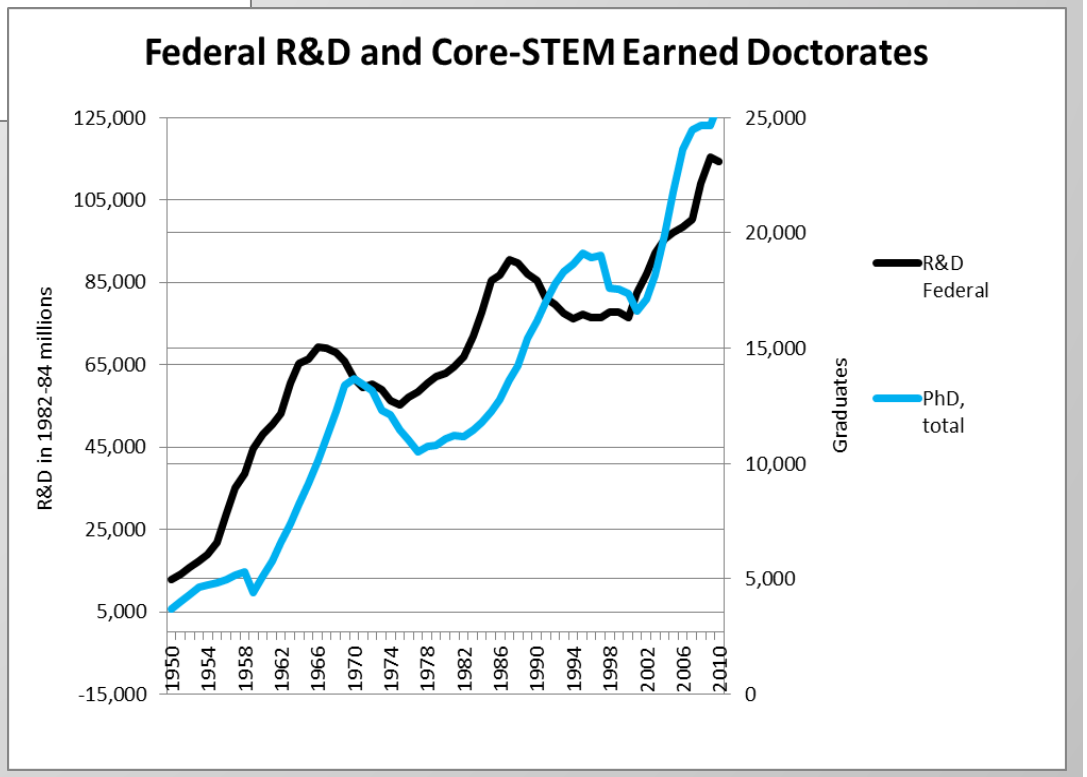
Note: The list of Computer and IT occupations was expanded considerably for the Current Population Survey in 2002, so that continuous data on the set of occupations currently identified as IT occupations can only go back to 2002. Some major computer and IT categories, such as "programmers," are available before 2002. Data on these workers are included to provide a longer data series for comparison purposes.

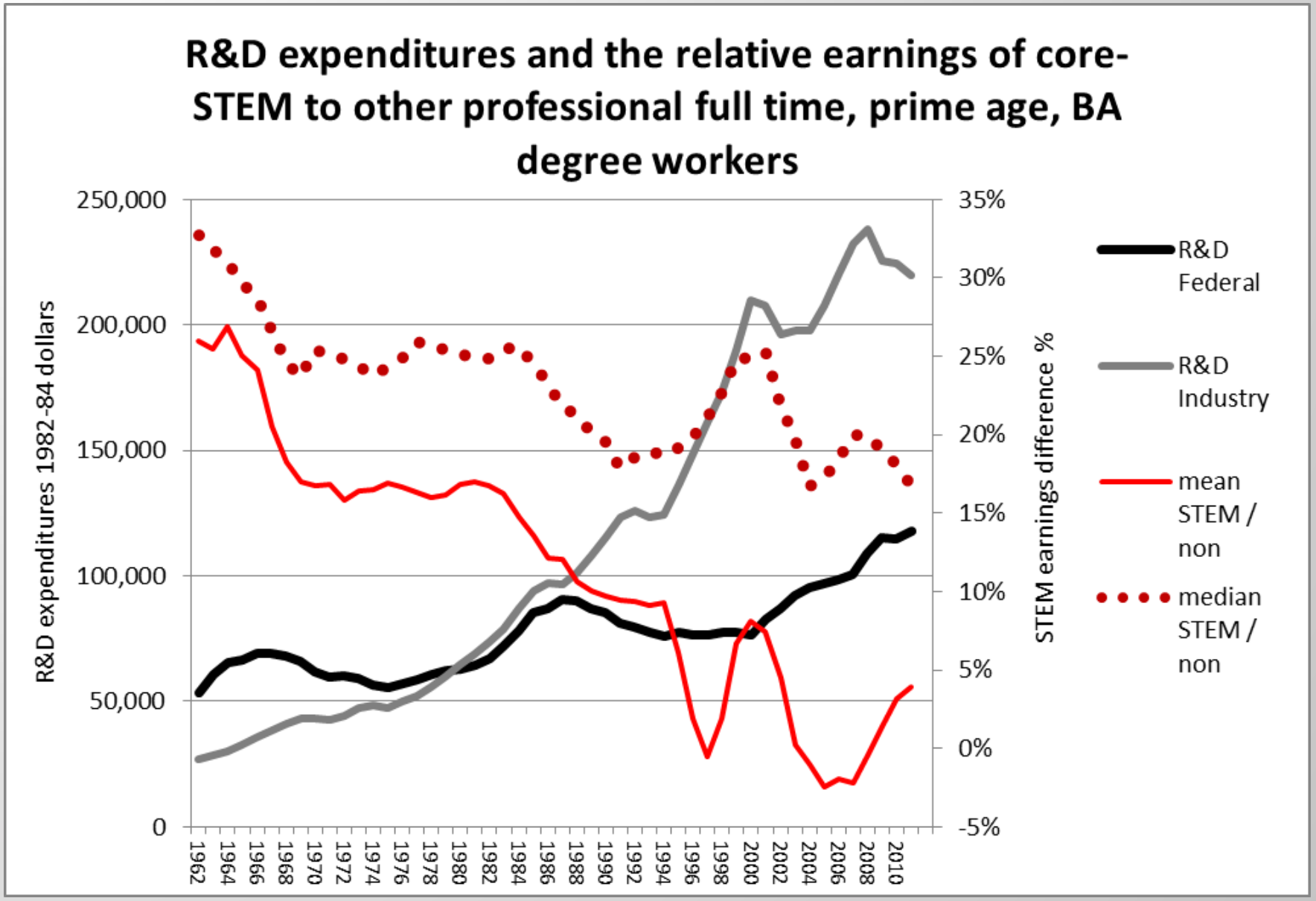
Source: Authors' analysis of Current Population Survey Annual Social and Economic Supplement microdata

STEM enrollments and government/industry R&D

- Research shows STEM enrollments track federal R&D (with sticky lags)
- Industry R&D – especially D – has increased significantly
- STEM earnings relative to other professional jobs has dropped since the Sputnik era


Federal R&D and Core-STEM Earned Bachelors
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
R&D Federal
BS, total


Federal R&D and Core-STEM Earned Doctorates
R&D in 1982-84 millions
125,000
105,000
85,000
65,000
45,000
25,000
5,000
-15,000
25,000
20,000
15,000
10,000
5,000
0
Graduates
1950
1954
1958
1962
1966
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
2010
R&D Federal
PhD, total


R&D expenditures and the relative earnings of core-STEM to other professional full time, prime age, BA degree workers
R&D expenditures 1982-84 dollars
250,000
200,000
150,000
100,000
50,000
0
35%
30%
25%
20%
15%
10%
5%
0%
-5%
STEM earnings difference %
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
R&D Federal
R&D Industry
mean STEM / non
median STEM / non

STEM observations

- Improving the pipeline in the absence of robust demand is not a good strategy

- But even if there is no shortage, there are needed improvements to the pipeline
  - Employers report shortage of soft not technical skills
  - Employers want just-in-time workers and need to invest in career training
  - Domestic minorities and women should be tomorrow's STEM workers
  - Technical degrees, non-college and college-masters, may be a preferred alternative