February 16, 2011

Refueling the U.S. Innovation Economy: STEM Reform

Dr. Robert Atkinson

President

*Information Technology
and Innovation Foundation*

ITIF

ITIF is public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington and in the states.
ITIF focuses on:

- Innovation processes, policy and metrics
- Science policy related to economic growth
- E-commerce, e-government, e-voting, e-health
- ICT and economic productivity
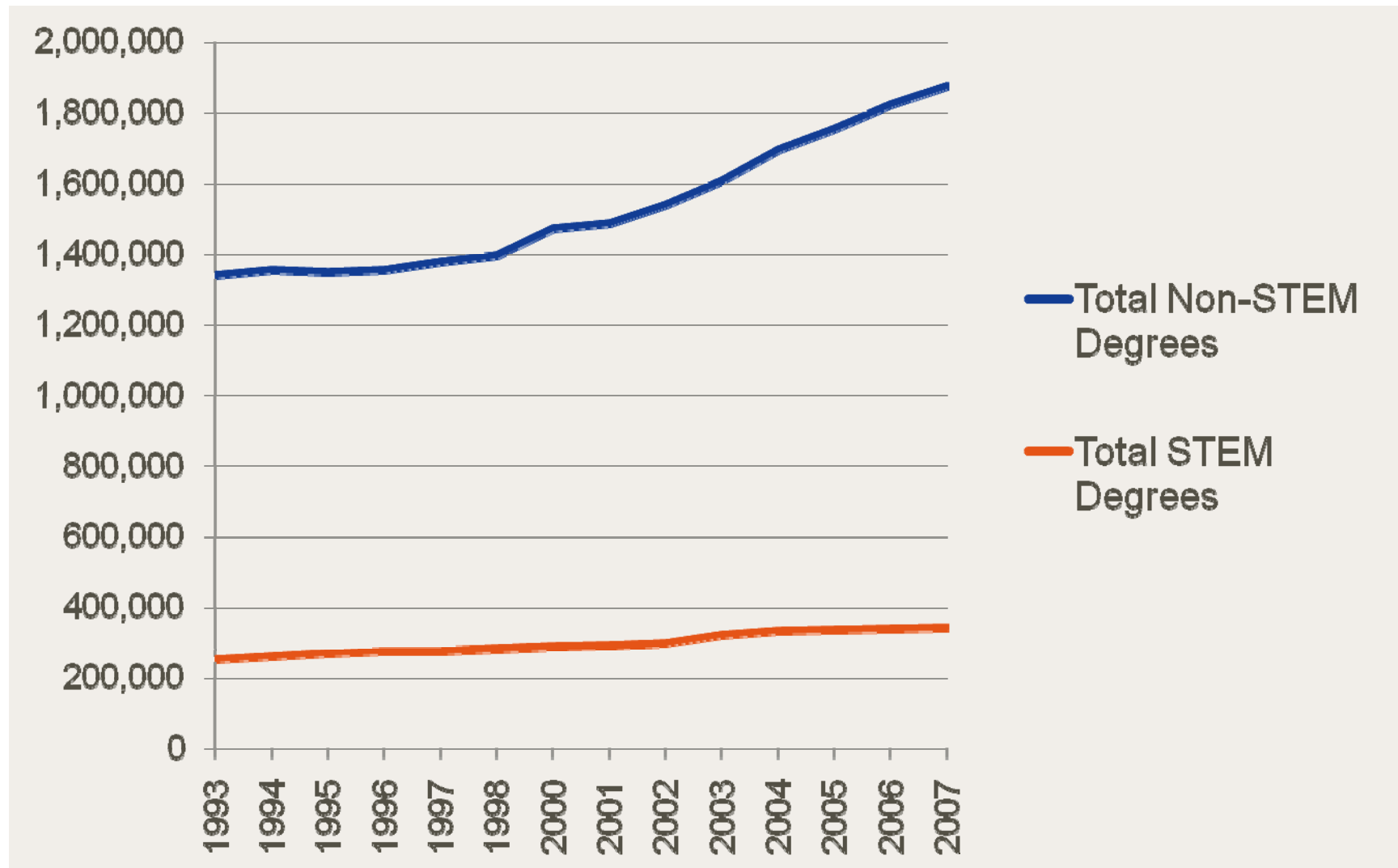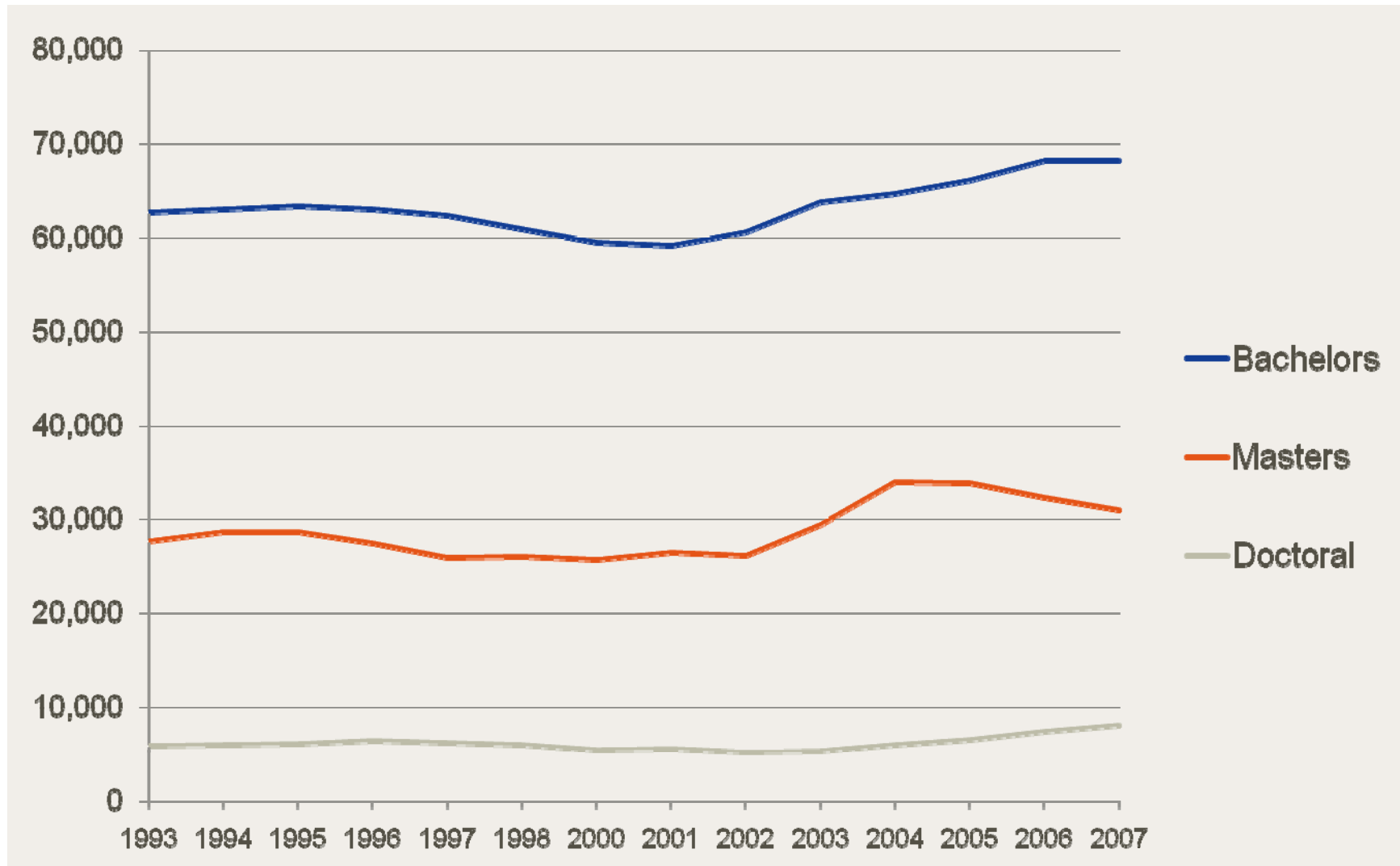- Innovation and trade policy

The Information Technology & Innovation Foundation

ITIF

Growth of Degrees: 2000 to 2007

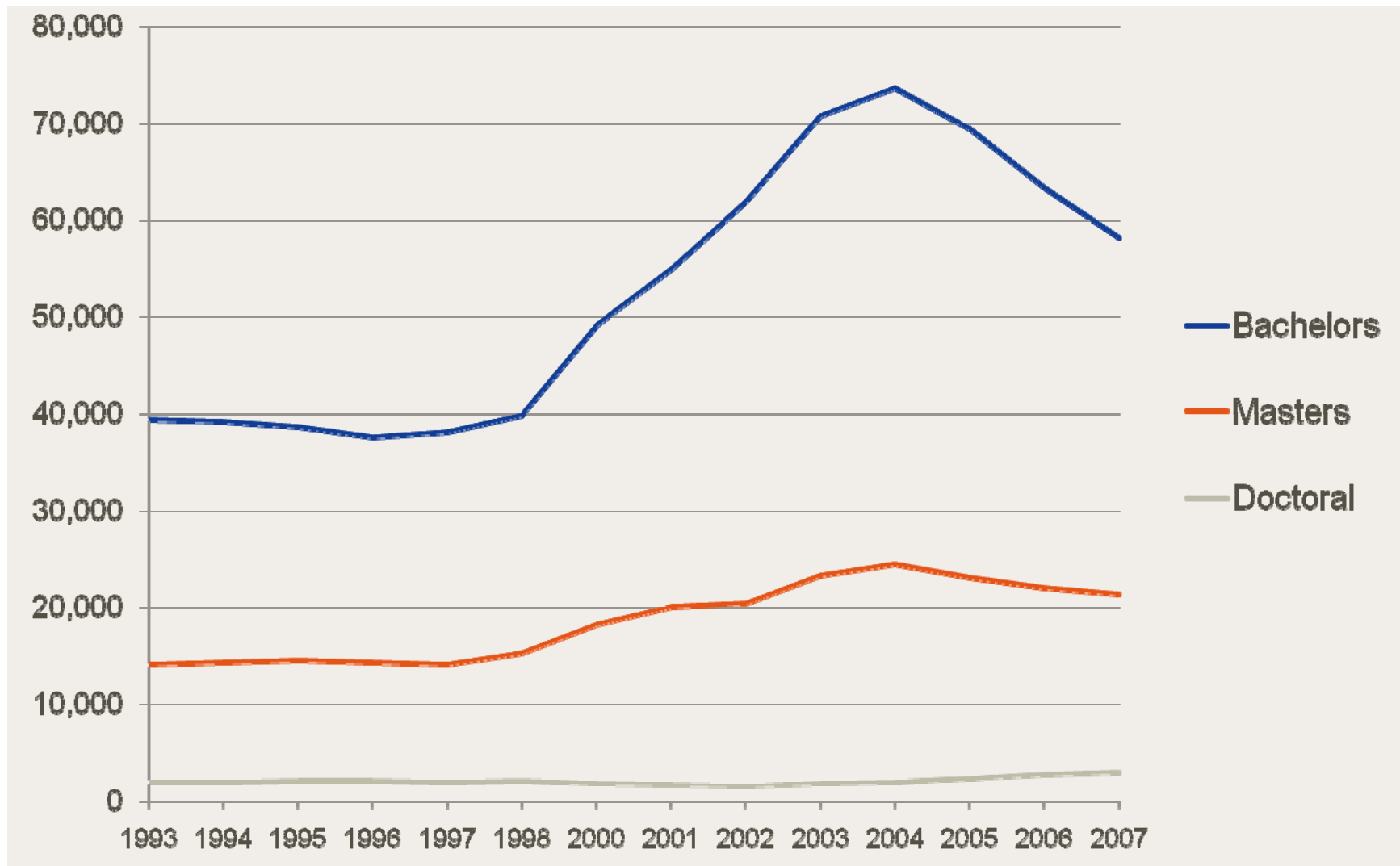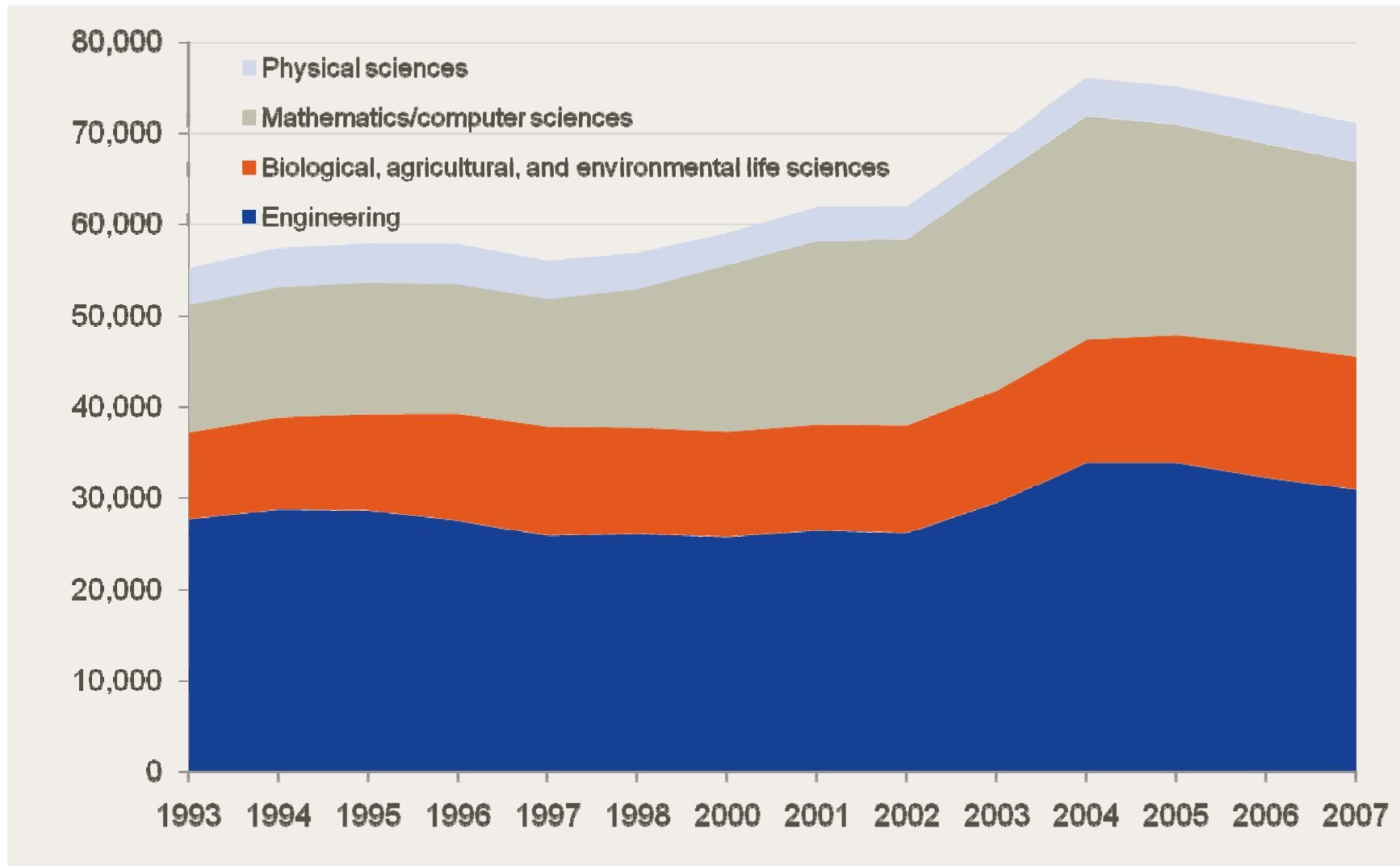|	STEM	Non-STEM
Bachelor's degrees	16 percent	24 percent
Masters degrees	20 percent	34 percent
Doctoral degrees	38 percent	34 percent

STEM vs. Non-STEM Bachelors Degrees Awarded

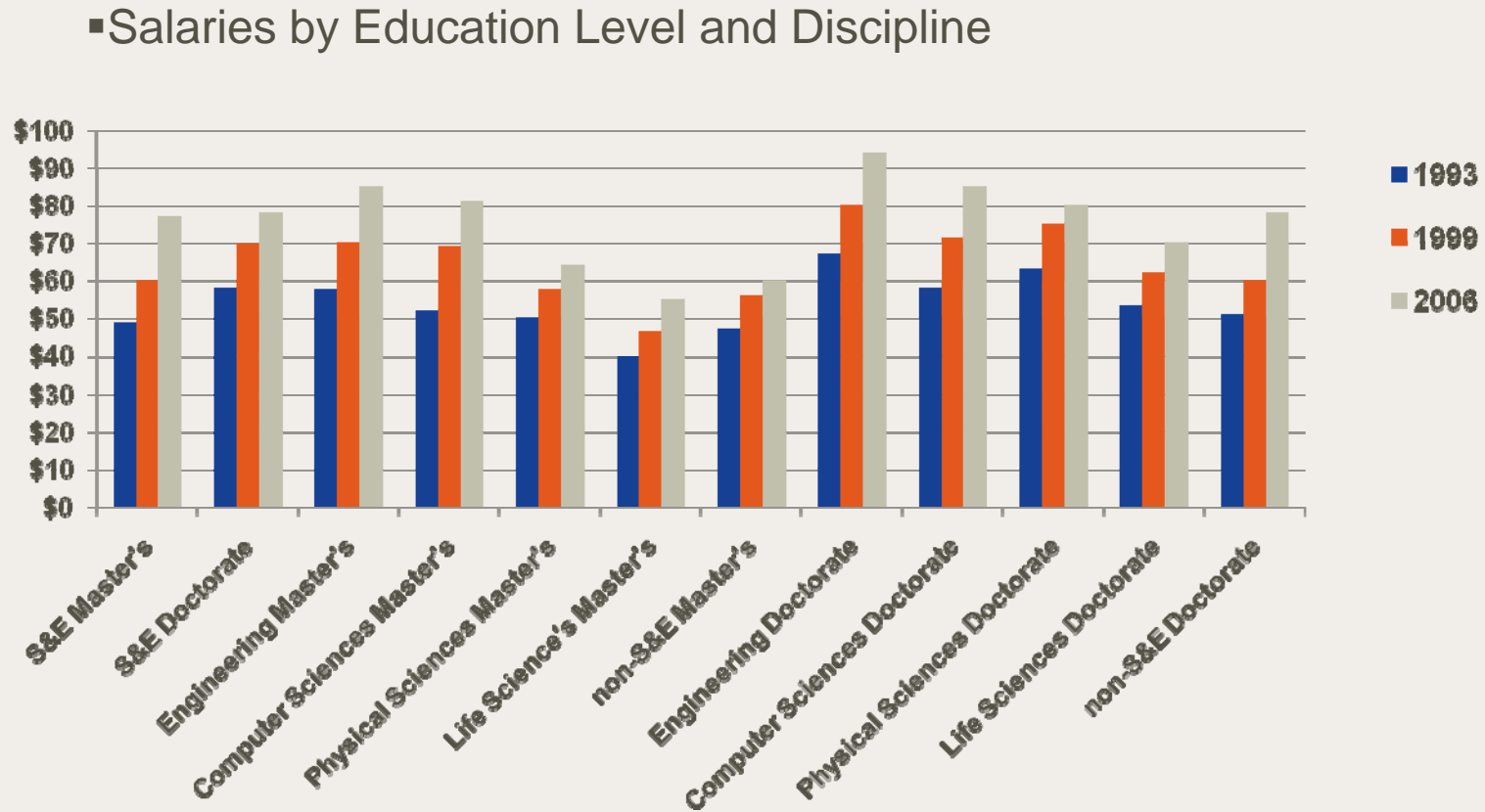# Engineering Degree Trends
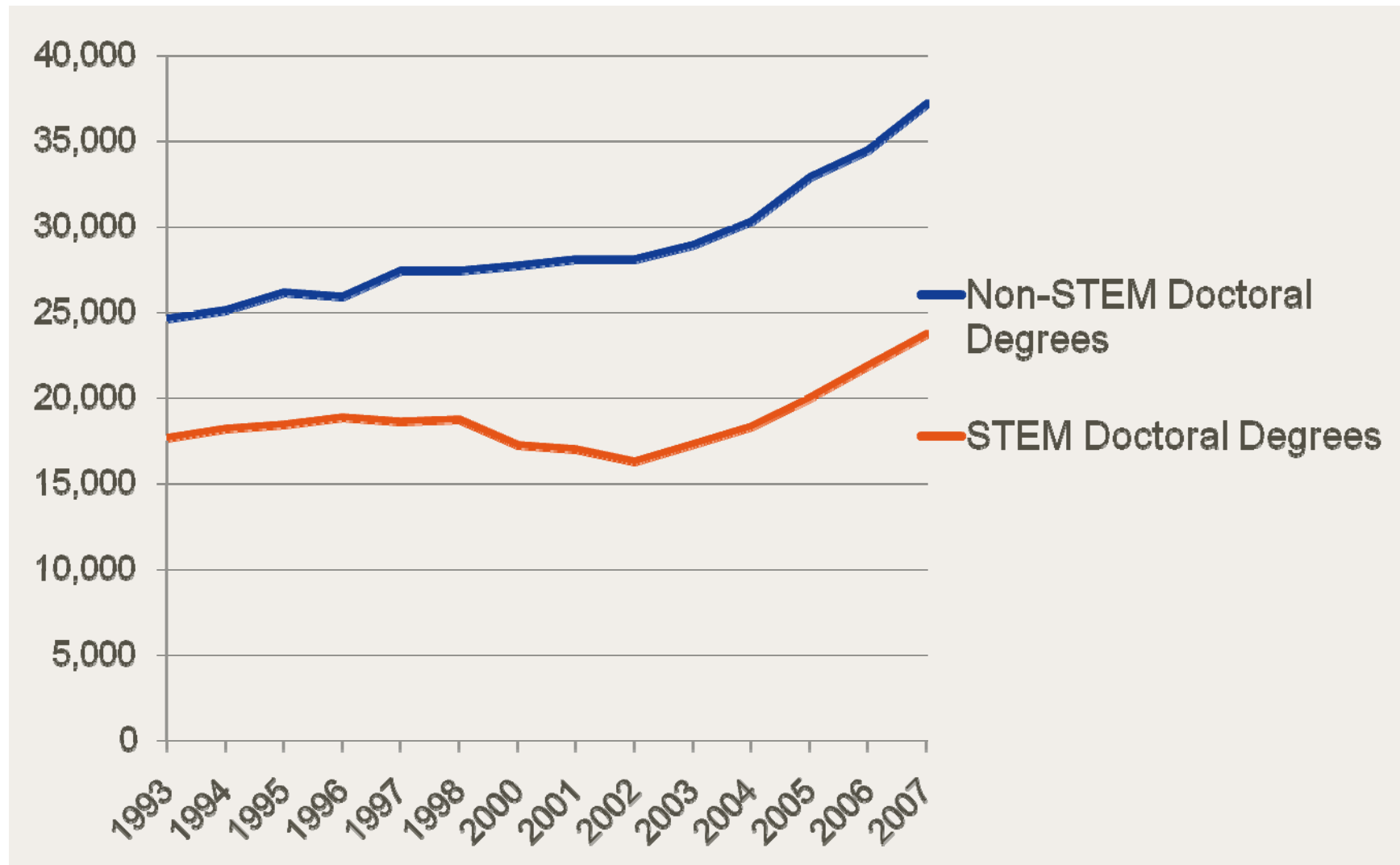
Mathematics/Computer Sciences Degree Trends

STEM Master's Degrees Awarded by U.S. Institutions

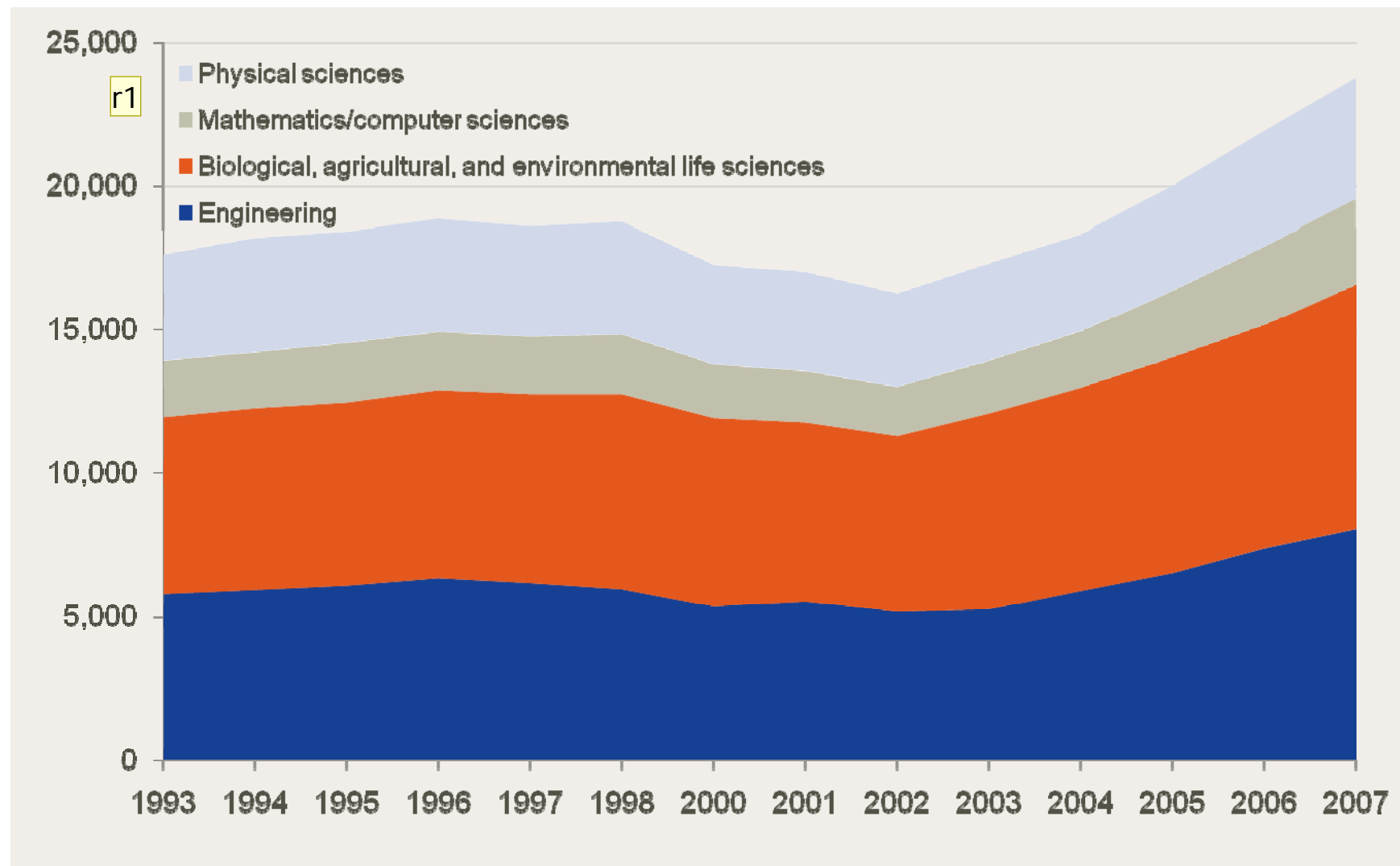# Why Aren't there More Professional Science Masters' Programs?

Salaries by Education Level and Discipline

STEM vs. Non-STEM Doctoral Degrees Awarded
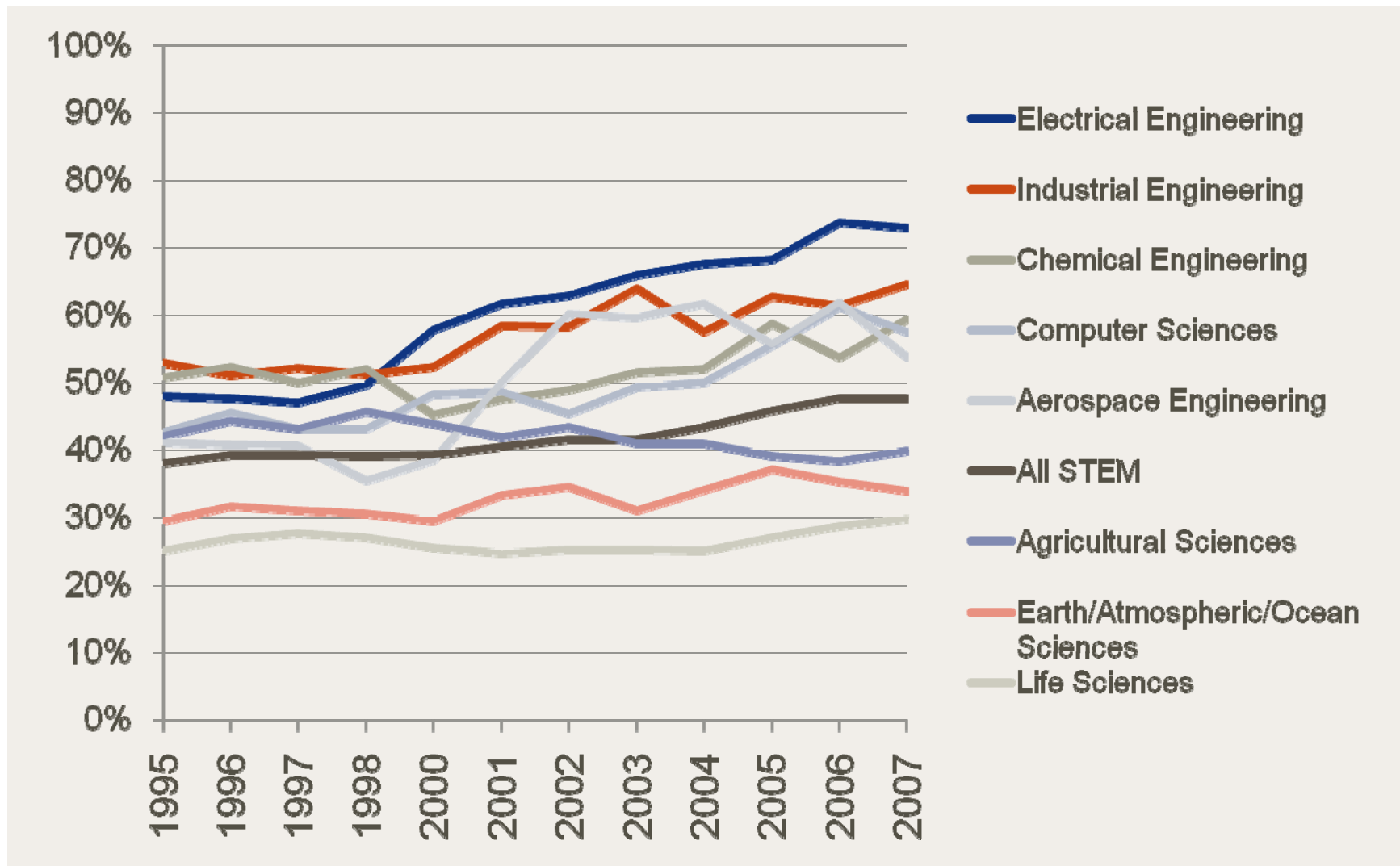
STEM Doctoral Degrees Awarded by U.S. Institutions

Slide 10
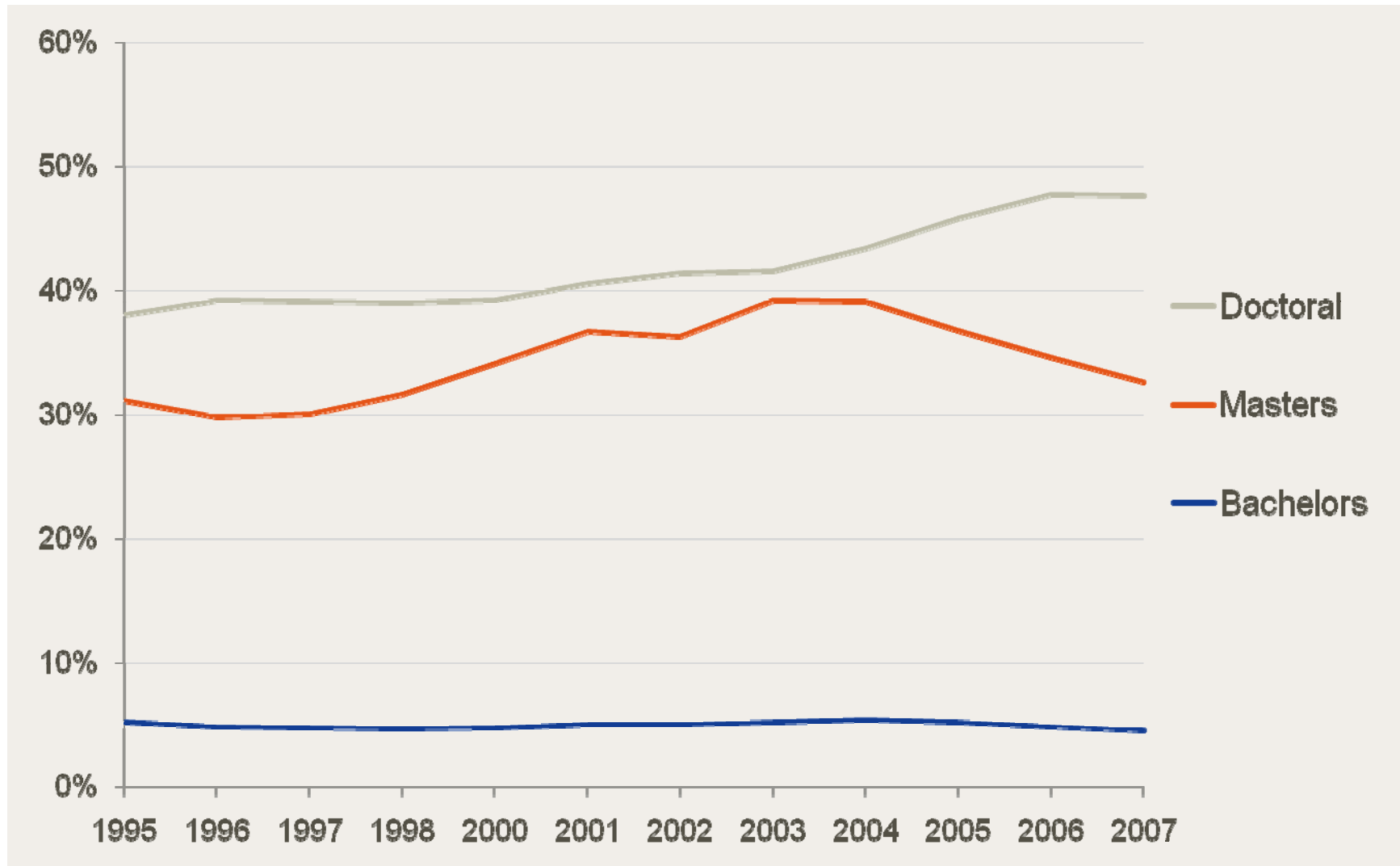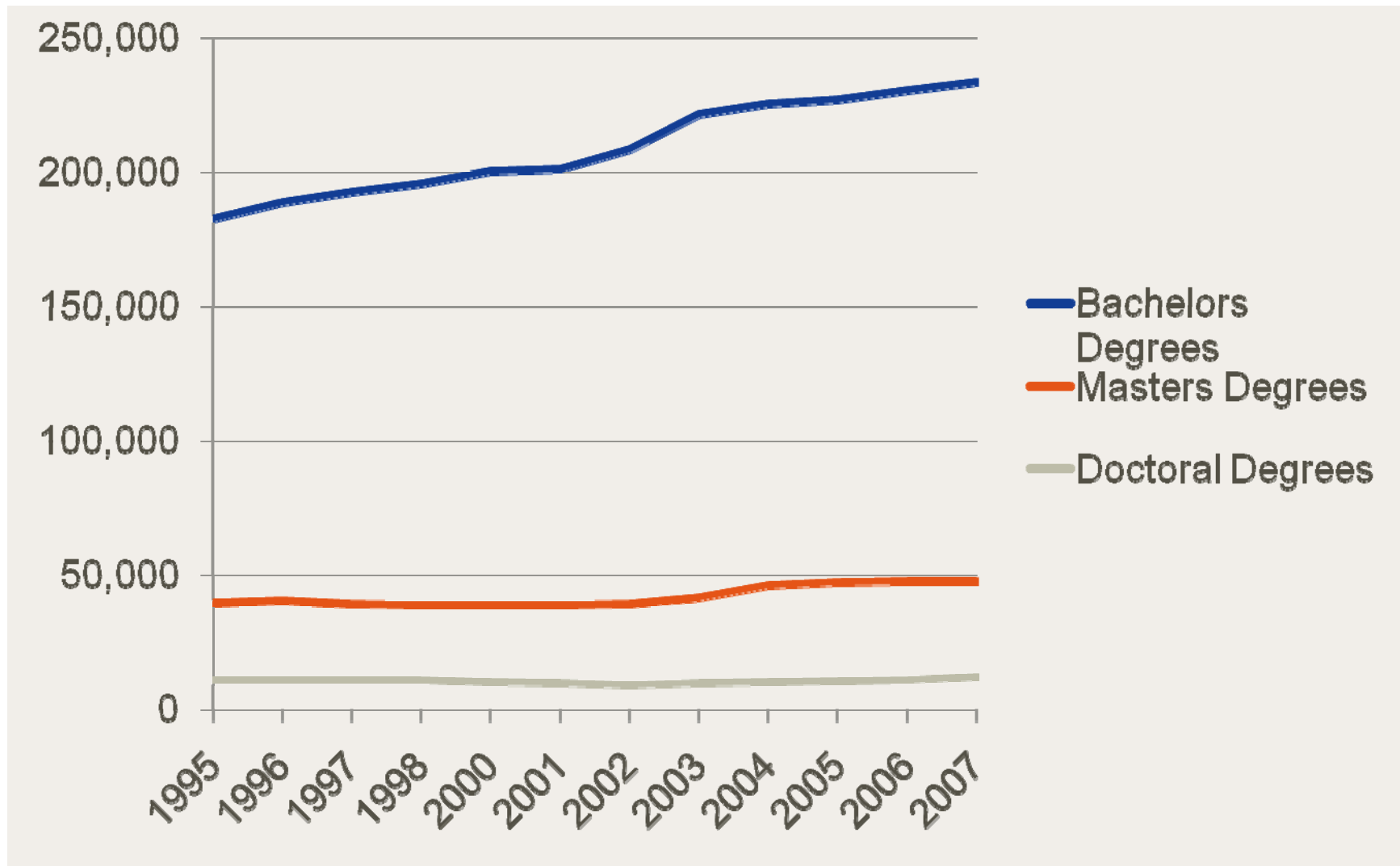
Share of Doctoral Degrees Awarded to Foreign Students by Detailed Field of Study, 1995-2007

Percent of Degrees Awarded to Temporary Residents

STEM Degrees Awarded to U.S. Citizens/Permanent Residents, 1995-2007

Natural Sciences and Engineering Doctoral Degrees per Thousand 20-24 Year Olds, 1993-2006
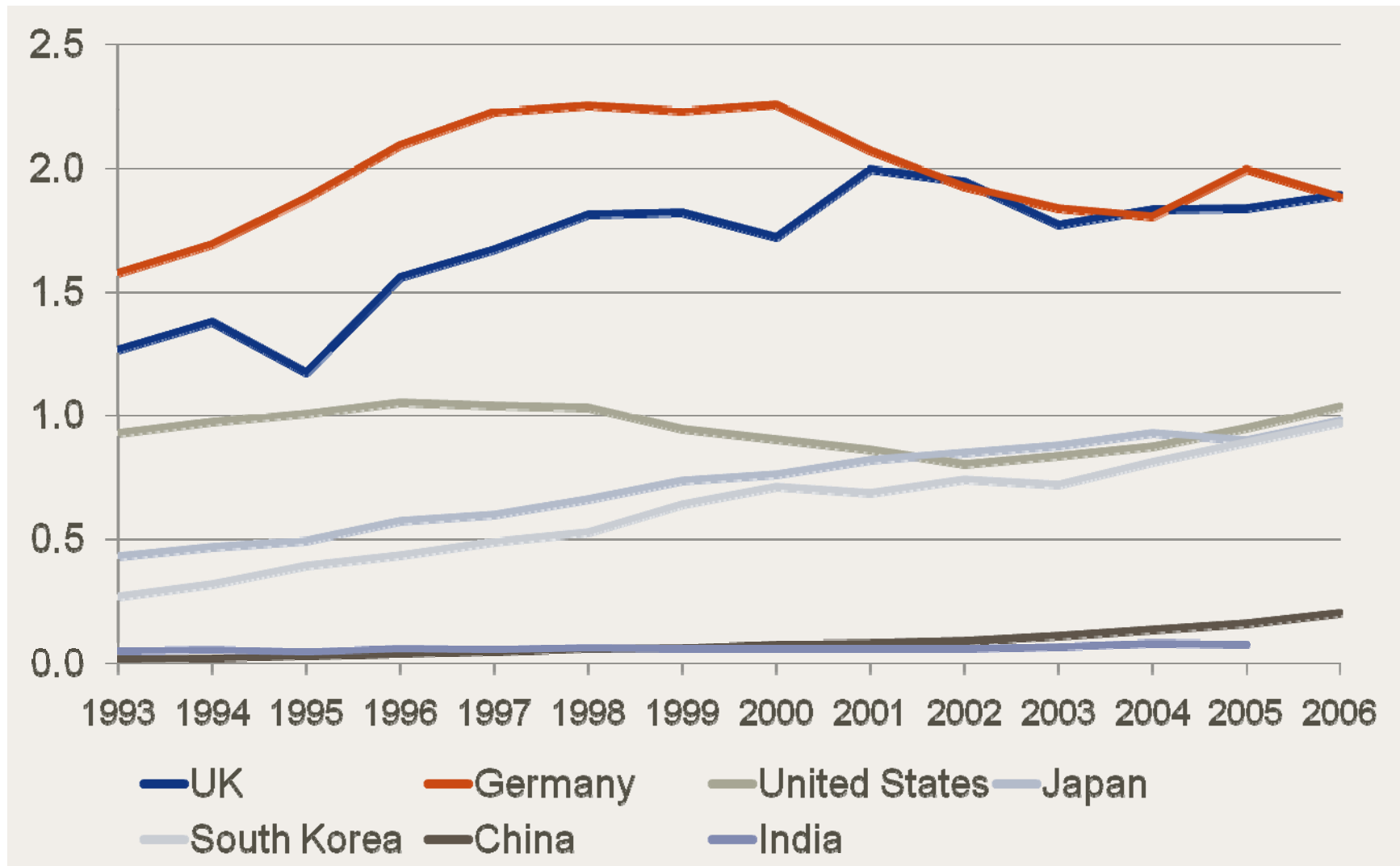
Problems with Assumptions of Current Approach to STEM

- **Improving STEM is not Linear, Mechanistic Process**

- **Giving All Students Some STEM is Expensive**

- **More Money Won't Solve the Problem**

- **More Requirements and Mandates Won't Solve the Problem**

- **Educating Students in a Vacuum Won't Solve the Problem**

Limitations of the "Some STEM for All" Approach

"Some STEM for All" approach is to make sure that every high school graduate and a much larger share of college grads become proficient in STEM.

Interventions at the K-12 level include:

- boosting K-12 teacher quality (e.g., increasing teacher pay, requiring higher STEM teacher qualifications),
- more rigorous STEM standards (e.g., expanding requirements for STEM courses, more rigorous testing and assessment),
- improving curriculum, and
- boosting awareness among students of the importance and attractiveness of STEM careers

Need a new "All STEM for Some" Approach

Importance of Interdisciplinary STEM education

- **Interdisciplinary graduate STEM work attracts more women (and perhaps, more minorities)**

- **Students want it. According to NSF more interdisciplinarity was an option that 75 percent of students want.**

- **Yet, Interdisciplinary programs are still rare.**

  Duke University is piloting a doctoral program to train engineers that can work across fields to find solutions to global challenges. University of Delaware is building an Interdisciplinary Science and Engineering laboratory that will locate classrooms next to Institutes focused on energy, environment, and public policy.
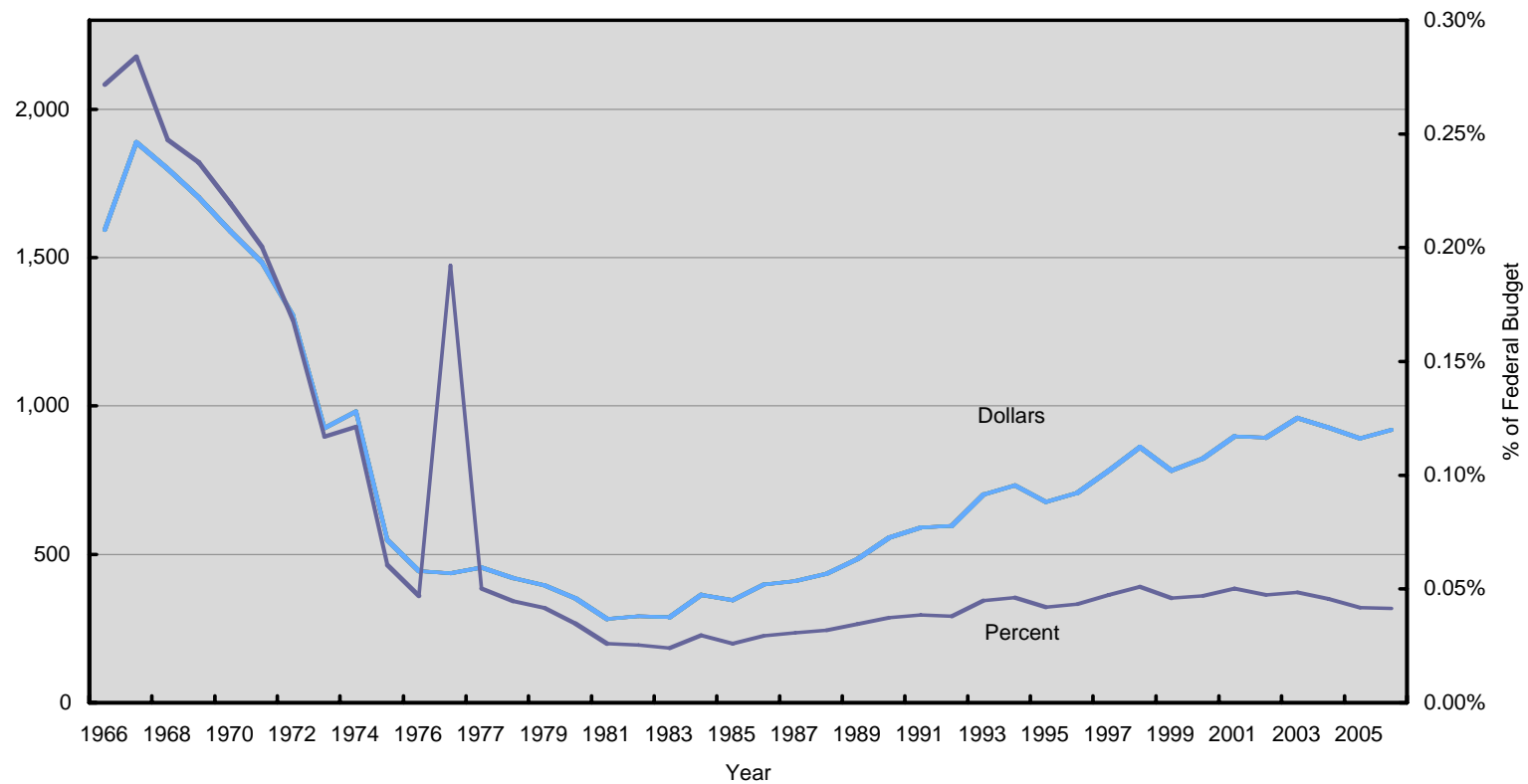
Policy Recommendations

- Expand funding for IGERT

- Develop an industry-ranked list of the best STEM departments. that reflects the quality of students (as future employees) produced by that department.

- Create more "Olin's" by changing the NSF "Transforming Institution" grants

Policy Recommendations

- Offer prizes of up to $35 million to colleges and universities that have dramatically increased STEM student STEM degrees and maintained those increases over 5 years.

- Increase industry co-funded academic research and graduate student fellowships.

Federal Ph.D. Fellowship Support

Policy Recommendations (Ph.D. Fellowships)

1) Provide a significantly (25 percent to 50 percent) higher stipend for fellowship recipients than research assistantship recipients.

2) Issue the fellowship award notifications prior to graduate school application deadlines. This allows the fellowship to influence which graduate school the recipient chooses to attend.

3) Offer fellowship recipients unusual enrichment opportunities such as a chance to visit with the President's Science Advisor or tour a nuclear submarine.

Thank you

ratkinson@itif.org

www.itif.org