

Do We Need More Scientists and Engineers?

Congressional Caucus on Science and
Technology


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Shortage/Shortfall Claims

- A commonplace for nearly 2 decades
- “Looming Shortfalls”, often = “shortages”
 - Led by NSF leadership late 80s
 - Echoes: academic, industry lobbyists
- Critiqued by NSF’s own experts (internal)
- But promoted publicly by then-leadership
- By early 90s?--surpluses instead
-  Congressional investigation of NSF role

Credibility..seriously damaged

- The “credibility of the [National Science] Foundation is seriously damaged when it is so careless about its own product.”
 - Rep. Howard Wolpe, Chair, Subcommittee on Investigations and Oversight, House Committee on Science, Space, and Technology, Hearing of April 8, 1992

Shouting “Fire”?

- ...the NSF Director’s shortfall prediction, “delivered up in the context of growing concerns about our nation’s competitive standing, was the equivalent to shouting “Fire” in a crowded theater...Today we will hear that number was based on very tenuous data and analysis...In short, a mistake was made, let’s figure out how to avoid similar mistakes and then move on.”
 - Rep. Sherwood Boehlert, Ranking Minority Member (now Chair of full Science Committee); hearing of April 8, 1992

Boehlert's Advice Unheeded

- “Shortage” reports from ITAA
- 1997: 190,000 IT jobs alleged “unfillable”
- 1998: 346,000 “shortfall”
- 2000: 843,000 “shortfall”
- Proposed solution: triple number of H-1B visas, from 65K to 195K/year

Lobbying Campaign Mounted

- “American Business for Legal Immigration” lobby established 1996
- Executive Director from American Immigration Lawyers Association
- Based at National Association of Manufacturers
- Funded by high-tech companies

Lobbying Success, 2000

- H-1B visas tripled for 2001, 2002, 2003
- 2001: collapse of high-tech bubble
- IT and EE unemployment rates on rise since
- EE: 6.4-7.0 % unemployed
- Computer programmers: 6.7-7.5 %
- Computer & math occupations: 5.4-6.0%
- (Would expect lower than average rates...)

Déjà vu, post-bust?

- “Throughout the Federal government, as well as the private sector, the challenge faced by a lack of scientists and engineers is real and is growing by the day.”
 - NASA Administrator O’Keefe, before House Science Committee August 2002. (Source: *APS News*, 10/02)

Déjà vu, all over again?.....

- “The Science and Engineering Workforce: Realizing America’s Potential” (National Science Board, November 2003)
- “Analyses of current trends [in the US science and engineering workforce]... indicate serious problems lie ahead that may threaten our long-term prosperity and national security.”

So, a hardy Washington perennial...but

- Shortfall claims lack rigor
- No credible quantitative evidence of shortages
- RAND, 2002
 - “...neither earnings patterns nor unemployment patterns indicate [a science and engineering] shortage in the data we were able to find.”
 - (Note: Latest data were from boom period 1999-2000...)

Overall, S&E labor markets slack

- ...with variations over time, and by field
- Consistent w/ tight labor markets in some specialties (especially new/growing)
- But, if anything, data point to surpluses
- RAND: *Rising S & E unemployment in 1990s*
“while the overall economy is doing well, is a strong indicator of developing surpluses of workers, not shortages.”
- Now: unemployment far higher, post-bubble

Science: Career Prospects Deteriorating

- Numerous reports expressing concern
- *“...the attractiveness to young people of careers in life-science research is declining” (NAS Tilghman report, 1998)*
- Tilghman 2003: new data for 2002
“appalling”

Science: Concerns About Creativity

- NIH concerns...much “stunning work...early in careers” [Wendy Baldwin]
- Bruce Alberts: “incredible” that average age increasing for first-time NIH grantees, despite budget doubling
- James Watson: “Now you’re supposed to wait until you’re relatively senile...”

Engineering Careers: Unstable

- B.S. most important (unlike sciences)
- Early 1990s: High-tech bust
- Late 1990s: High-tech boom
- 2001-present: High-tech bust (again...)
- Large-scale import via expanded H-1B
- Rising offshore outsourcing
- Layoffs up, mainly mid-career

But What About the Future?

- Comparisons of projected demand and supply are staples of S & E shortfall claims
- Yet workforce forecasts notoriously weak
- 1. High-tech unpredictable, boom-bust
- 2. Federal funds loom large, but uncertain
- NRC, 2000: “*Accurate forecasts have not been produced.*”
- No one can forecast S&E scene in 2012...

A Misdirected Focus: Enhance Supply by...

- Reforming K-12 (good on other grounds)
- Information campaigns
- Increasing financial incentives
- More role models (also good)
- Importing more students/workers

Demand: Little Attention

- Are S & E careers increasingly unattractive?
- ...relative to alternatives US students have?
- Do they represent good career choices for bright & well-informed young Americans?
- NOTE: Costs/benefits very different for foreign students

Career Opportunities vs. Personal Investment

- S&E careers require large personal investments: of \$ and time
- Less for engineering, more for science
- Extreme case: biosciences now 9-12 year apprenticeship post-baccalaureate
- Even then, uncertainty if can “practice”
- Opportunity costs high: e.g. >\$1 million discounted lifetime earnings vs. MD, MBA

Career, but Also a “Calling”

- The intellectual challenge of discovery
- The life of the mind
- The opportunity to contribute
- Happily, some fraction are “called”
- But are others voting with their feet?

Why “Shortages” Perennials?

- No one seeks to do harm
- Simply pursuing interests in political sphere
- And “shortage” claims do sell: effective lobbying tools with politicians and companies
- Ex: Lobbying success (2000) in tripling H-1B
- Ex: *“We can’t drop our best selling point to corporations--shortages of qualified candidates...”*

–David Peyton, Director, Technology Policy, NAM , 10/28/02

Searching for Signals

- **Have searched for credible signals of current “shortfalls” of S&E’s, e.g.:**
 - rising wages
 - shortening time-to-degree
 - entry from outside S&E occ’s
- **Such signals have not emerged**
- **Believable forecasts of future shortages?**
- **None seem credible beyond short-term**

High tech booms: did they evoke domestic supply?

- Some, e.g. CS enrollments soared
- But booms were too short-lived
- And political intervention to increase imports (e.g. H-1B) may have aborted domestic market responses

Domestic supply desired?

- Assess if S&E careers attractive *relative to* others available to smart US students
- *“Altogether, the data..do not portray the kind of vigorous employment and earnings prospects that would be expected to draw increasing numbers of bright and informed young people into [S&E] fields.”* [RAND, 2002]
- Challenge #1: Make careers competitive and commensurate w/ personal investments?
- #2: Make education more agile (PSM?)

SO: S&E Labor Markets have complex dynamics

- Supply: personal investments
- Demand: uncertain, w/ booms and busts
- Market supply can adjust rapidly, esp. BS, master's, & “lifelong” learning
- Even more agile supply responses desirable
- But abort adjustments, depress domestic supply?
- Topic needs serious, objective attention...
- BUT “shortage” claims have perverse effects

Comments/Questions?:

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