Do We Need More Scientists and Engineers?

Congressional Caucus on Science and Technology
July 15, 2004
Washington, DC

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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

- 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?....

- “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
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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