America Has More Trained STEM Graduates Than STEM Job Openings
So Why Import Foreign High-Tech Workers?

By David North

It has become quite clear that America has more high-tech college graduates than needed to fill high-tech jobs now and, importantly, the nation will keep producing many more such graduates than job openings in the future — so why the shrill calls from the industry that there is a shortage?

The debate revolves around two sets of initials: STEM (science, technology, engineering, and math) graduates and workers and the H-1B temporary worker program that floods our labor markets with low-cost, docile, high-tech nonimmigrant graduates, mostly working in computer-related industries.

Why the demands, as supported by the Senate's Gang of Eight, from industry for huge increases in the number of H-1B workers? Is it a genuine shortage of talent, as the industry claims, or is it because, as the *Wall Street Journal*[1] of all publications, put it, the firms want to continue to staff their operations "with Indian expatriates who earn significantly less than their American counterparts"? I think the *Journal* has it right.

Comparison of Projected BLS Job Openings Data, 2010-2020, with a Projection of NSF and DoE Data in the Same Time Period on Degrees Earned by Citizens and Green Card Holders in the STEM Fields (Architecture and Social Sciences Excluded)

Projected STEM job openings over 10 years	**2,537,000**
Projected STEM earned degrees* over 10 years	
Associate's	440,000
Bachelor's	2,652,000
Master's	569,000
PhD's	258,000
Total:	**3,919,000**
Ratio of projected degrees to projected job openings:	**1.55**

* By citizens and green card holders

Data Sources: Job openings, Bureau of Labor Statistics; earned degrees (minus those in architecture and the social sciences), based on National Science Foundation data for STEM degrees awarded (see also appendices 19, 26 and 28) in the year 2009 as a proportion of all degrees multiplied by the total projected awards of all degrees in the years 2009 to 2019 as projected by the Department of Education; see Tables 32 to 34 in the National Center for Education Statistics publication "Projection of Education Statistics to 2021".

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As to the future supply and demand, this is the big picture as drawn from data from the Bureau of Labor Statistics (on future job openings) and from projections drawn from Department of Education and National Science Foundation data (on high-tech degrees likely to be awarded to U.S. citizens and green card holders in the decade to come).

The table above deals with the *future*. Meanwhile, the Economic Policy Institute recently released a comprehensive study dealing with the supply and demand of STEM graduates showing similar findings in the *immediate past*. One of its findings was:

> *For every two students that U.S. colleges graduate with STEM degrees, only one is hired in a STEM job.*

That study[2] was by three experts in the field (Hal Salzman, a Rutgers professor, B. Lindsay Lowell, of Georgetown University, and Daniel Kuehn, who has worked with both the Urban Institute and EPI). It stated that "in computer and information science and in engineering, U.S. colleges graduate 50 percent more students than are hired into those fields each year."

It also found that "the annual inflows of guestworkers amount to one-third to one-half the number of all new IT job holders."

Further, it concluded that "there is a robust supply of domestic workers available to the IT industry."

Finally, in a classic economist's rebuttal to industry allegations of a shortage of talent, the authors noted that had there been a genuine labor shortage, wages would have risen, but "wages have remained flat [in the IT field] with real wages hovering around their late 1990s levels."

Hidden Findings. Returning to our CIS projections in the high-tech fields shown earlier, it is useful to note that the Obama administration, gung ho on giving the computer-centric industries everything they want in terms of more high-tech workers no matter how many resident workers are hurt in the process, has not worked with these readily obtainable data on the future trends in the supply and demand for STEM workers.

No one from the White House or the Department of Homeland Security has pulled together the numbers used by either CIS or EPI above, though all come from official data sets.

Further, one should bear in mind while looking at these supply and demand numbers that the United States is routinely bringing in a million new immigrants a year, as well as more than 100,000 new H-1B high-skilled workers as nonimmigrants.

There are, under current law, two nonimmigrant ceilings: 65,000 for ordinary H-1Bs and 20,000 more for those with U.S. graduate degrees — mostly two-year master's degrees — as well as many more who are working for universities or entities more or less connected to universities; the last group has no numerical limit. Most of the H-1B's are in IT.

But do we need any more high-tech migrants at all? Do we need any?

Before answering those questions, we should note that we have removed all data on the categories of architects and social scientists from these STEM counts, as there is little demand for foreign workers in those professions.

The remaining data show that there will be three new high-tech degree holders for every two high-tech job openings for the 10-year period, even if employers restricted their future hiring to *new grads only*. In addition, there are millions of unemployed college graduates out there, and even larger numbers of STEM-trained people employed in other lines of work. America is swimming in IT talent.

The focus on new university graduates that dominates the industry's immigration policy statements is a hidden indication of the not-often-discussed elephant in the room — the ease with which employers can hire docile, young foreign workers permits wide-spread *de facto* discrimination against older (35-plus) American workers.

Which brings up another point: the industry's constant talk about the need for recent STEM college graduates blurs the policy conversation. Should not the policy discussion be about the *total* supply of STEM workers and the *total* need for such workers, not the number of new graduates? Industry is only too happy to ignore the large numbers of resident STEM workers who are unemployed, or more likely, working in non-STEM jobs.

Do IT Jobs All Need IT degrees? A predictable response of industry to our supply and demand numbers will be: you are only showing the big picture you are *not* comparing the number of new jobs in the IT industry to the number of residents securing IT-specific degrees. That's both narrowly correct, and totally misleading.

Yes, if one were to look into the numbers above, one would find that BLS predicts more openings in what it calls "computer operations" than the projected number of brand-new graduates with computer training.

But there is a big catch, as Daniel Costa of the Economic Policy Institute pointed out in a useful paper[3] last fall:

68 percent of the workers in the IT industry do NOT have a computer-related degree
and
31 percent of them do not even have a STEM degree.

So why should we pay much attention to the ratio between new computer science grads and the industry's alleged needs, when the industry pays so little attention itself? Except of course, when it wants to try to support its complaints of "labor shortages", when it means salary savings, and when it says it needs the "best and the brightest" to do technical work, much of which is pretty ordinary, as Professor Norm Matloff of UC/Davis[4] often has pointed out.

Costa's source for the statement above is another NSF study, the "2003 National Survey of College Graduates".

Most of us, in our private lives, incidentally, probably know a computer whiz or three, and the chances are that one or more of them did not major in computers in college.

Industry Overstates the Need for Advanced Degrees. Let's look a little further at the industry's rhetoric in its efforts to push through a "staple bill", one that would affix a green card to the diploma of every alien who secures an American advanced degree in STEM. This is just one of the lobbyists' efforts to increase the flow of foreign workers into the United States; they are also seeking to make the ceilings much higher in the nonimmigrant H-1B program, and to make it easier for STEM people to secure green cards after working as H-1Bs.

There are also provisions in S.744, the Gang of Eight's proposal for comprehensive immigration reform, making it easier for those with advanced STEM degree from U.S. educational institutions to get their green cards; more specifically, unlike other aliens with employment-based visas, were the law to be enacted, they would be admitted outside of numerical ceilings.

Note that these provisions are directed at foreign workers who secured either a STEM master's degree or a PhD in this country; this is clearly for an elite group among the foreign workers currently employed in the H-1B program, and others, but do labor-demand data show a particular need for employees with such degrees? Not really.

The Bureau of Labor Statistics' scholarly publication, *Monthly Labor Review*, ran an article[5] last April on this point showing the "typical education needed for entry" into a number of occupations and sub-occupations.

In engineering and architecture there were 35 such subcategories, and none showed a need for more than a bachelor's degree; in the computer and mathematical field, again, only three of the 16 subcategories called for more than a bachelor's degree.

Further, we know from a long series of articles[6] by the Oak Ridge Institute for Science and Education (another government operation) that a substantial majority of aliens with American PhDs in science and engineering manage to stay in the United States for many years after graduation under current laws.

In short, the staple bill and the S.744 provisions on this point both look like alleged solutions valiantly looking for problems to be solved.

Academic/Labor Market Mismatches. There has long been what might be regarded as a mismatch in America between the specific fields of advanced education and the labor market, which we see currently in the STEM field. For example, prominent commentator Andrew Hacker wrote the following:[7]

[The] most recent Occupational Outlook Handbook [a BLS publication] uses payrolls for 2006 as a base, and then offers employment estimates for 2016. I was surprised to learn that in 2006 the nation altogether had only 17,000 paid

*positions for physicists, apart from teachers, and that only 1,000 more openings are envisaged for 2016. The number of employed mathematicians is expected to rise from 3,000 to 3,300. … Employment for engineers is slated to grow from 1,512,000 to 1,671,000, about the same percentage of growth as for the workforce as a whole. Indeed, **at current rates, 650,000 new engineers will have received degrees by 2016, four times the predicted number of openings.** Hence a high attrition rate. Most reach salary ceilings early — chemical engineers average $73,300 at midcareer — so many shift to sales or management. Perhaps our society would benefit were we to train more people in science and technology. But no matter how estimable their knowledge, when employers say they don't need more of these employees, it tells us either that there aren't tasks for them to do, or that money isn't there [to hire them].*

So a rational approach by the universities might be to train more residents in IT, and perhaps fewer in math and engineering, but the momentum inside math and engineering departments would tend to blunt any such changes. And, or course, some students, particularly at the PhD level, are consumed with an interest in fields that have feeble employment prospects.

Astronomy anyone?

Yes, shifting academic priorities to make them closer to those of the labor market would be a good idea in the long run despite the inherent difficulties in such moves; and while this is happening there may be a need for some really temporary admissions — but certainly not more than current levels — of some nonimmigrants in some very precise fields, perhaps some in IT, but there is no need for anything as massive and as long-lasting as industry's current requests.

There may be some actual, short-term personnel gaps here and there, but we do not need a permanent Mississippi River flood of new alien workers to close those temporary shortfalls.

Finally, What IT Wages Tell Us. Returning to the wage-levels point raised by the three EPI authors, I get a kick out of lobbyists and industrialists who urge that business be allowed to run free of needless regulation and government interference, and yet urge direct governmental intervention in the labor market by permitting the massive infusion of inexpensive and young foreign workers.

Are these guys capitalists or socialists? The answer is that they take one route or the other depending on how it will serve the specific industry in question at the specific moment in time.

Right now they are all for substantial government intervention in the labor market by permitting the admission of many more foreign workers.

And how do such admissions square with the most fundamental rule of capitalism — that the markets regulate prices and wages? Bear in mind that those seeking more alien workers to keep wages in check are the same people who would scream to high heaven if the government sought to control prices.

Are there indications in the wage patterns of a *real* shortage of IT workers?

As Costa indicated in the previously cited[8] article, "average wages in the computer and mathematical occupations for workers with at least a bachelor's degree" barely moved from 2000 to 2011 when studied in 2012 dollars (i.e., in constant dollars). Using Current Population Survey data he found that average hourly wages had moved from $37.27 in 2000 to $39.24 in 2011, *an average annual increase of about 18 cents an hour.*

Some shortage!

End Notes

[1] "Face-Off on Visas Pits U.S. Against India", *The Wall Street Journal*, April 23, 2013.

[2] Hal Salzman, Daniel Kuehn, and B. Lindsay Lowell, "Guestworkers in the high-skill U.S. labor market: an analysis of supply, employment and wage trends", Economic Policy Institute Briefing Paper, Washington, DC, April 24, 2013.

[3] Daniel Costa, "STEM Shortages? Microsoft report distorts reality about computing occupations", Economic Policy Institute Policy Memorandum, Washington DC, November 19, 2012.

[4] See Norm Matloff's webpage.

[5] Dixie Sommers and Teresa L. Morisi, "Employment projections through the lens of education and training", *Monthly Labor Review*, Bureau of Labor Statistics, Washington, DC, April 2012.

[6] See the citations in my CIS blog "Big Majority of Foreign PhDs Stay in the U.S. Many Years After Degree", January 19, 2012.

[7] Andrew Hacker, "Can we Make America Smarter", *New York Review of Books*, Vol. 56, No. 7, April 30, 2009.

[8] See end note 3.