



The Native-Born STEM Shortage

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Executive Summary

This paper examines current labor force trends and projected occupational growth rates to shed light on the potential labor shortage in Science, Technology, Engineering, and Math (STEM) occupations. We find that if current trends continue, in 2024:

- The U.S. will be short 1.1 million STEM workers overall,
- Approximately one million of the unmet STEM worker demand will be for U.S. citizens, and
- The health care industry is among the fastest growing in the economy and will face the greatest shortage of STEM workers.

One response to this shortage would be for policymakers to increase legal immigration by expanding the H-1B program for high-skilled foreign labor. They could also extend Optional Practical Training to give international students sufficient time to contribute to the U.S. economy after graduation and match with an H-1B employer.

Introduction

Programs that allow foreign workers to temporarily come to the United States, like the H-1B visa program for highly skilled migrants, are controversial. Critics believe they enable immigrants to take jobs that would otherwise be filled by qualified American workers. Recently, several presidential candidates have warned against the H-1B program's negative labor market impacts, vowing to [suspend](#) or [eliminate](#) it altogether.

Last month the [Senate Subcommittee on Immigration](#) held a hearing to debate this exact issue. Some participants suggested that the H-1B program is a beneficial tool for employers to fill the current shortage of American talent in Science, Technology, Engineering, and Math (STEM) occupations. Others warned that access to cheaper, foreign labor incentivizes employers to displace native workers even though no STEM shortage exists.

This debate is nothing new; groups on both sides have presented empirical evidence both proving and disproving the existence of an American STEM worker shortage.¹ In this paper, The American Action Forum (AAF) investigates the supply of native-born STEM workers in the United States to evaluate the merits of the H-1B program.



Methodology

To determine what, if any, STEM shortage likely exists we first need to identify which jobs qualify as STEM. While there is no universally accepted definition, the Standard Occupation Classification (SOC) Policy Committee submitted a recommended list of 184 STEM occupations to the Office of Management in Budget (OMB) in 2010.ⁱⁱ These occupation codes match the codes used by the Bureau of Labor Statistics (BLS) and will be employed in this paper.

Second, AAF utilized data from the 2014 BLS Employment Projections to estimate the total demand for STEM workers over the next decade.ⁱⁱⁱ We specifically concentrate on BLS projections for the number of job openings due to growth and replacement needs for each occupation from 2014 to 2024.

Third, we project the supply of STEM workers by estimating the compounded annual growth rate of STEM employment from 2004 to 2014. Assuming that this long-term growth rate will persist, we apply it over the next decade to determine the quantity of native STEM workers in 2024. Similar research has used college graduates' areas of study to estimate the pool of potential STEM workers, but a STEM degree does not necessarily translate into a STEM occupation. The Center on Education and the Workforce at Georgetown University found that just over half (56 percent) of all college students with STEM degrees work in STEM fields after graduation.^{iv} The rest, they assert, gravitate to outside fields that increasingly demand STEM competencies like critical thinking and problem-solving skills.

To distinguish between native and foreign STEM workers we utilize the Current Population Survey, a monthly survey of unemployment and labor force participation.^v The March Supplement includes data on citizenship status in addition to employment, and was used to determine the percentage of foreign versus native workers in each STEM occupation. For this study, AAF is interested specifically in the distinction between U.S. citizen workers, including both native born and naturalized citizens, and noncitizen workers such as those in the H-1B program.

Finally, we estimate the future STEM shortage or surplus by comparing the projected supply of STEM workers in 2024 with the projected demand (represented by STEM job openings). We further apply national population weights in the CPS data files to isolate the supply and demand of U.S. citizen STEM workers, not including H-1B and other noncitizen foreign workers.



Results

We find that if current trends continue the U.S. will likely be short 1.1 million STEM workers in 2024. The following table shows the future supply and demand of all STEM workers, including temporary foreign guest workers.

Table 1: Total STEM Worker Shortage in 2024

Projected STEM Openings	Annual Growth Rate of STEM Workers	Total Projected Growth	Shortage
6,170,400	2.5%	5,069,773	1,100,627

Table 2 examines the future shortage of only U.S. citizen STEM workers. This does not include any H-1B or other temporary, noncitizen labor.

Table 2: Stem Worker Shortage in 2024 by Selected Occupational Group and Citizenship Status

Occupational Group	U.S. Citizen Workers	Percent of Total Workers	Total Projected Shortage	U.S. Citizen Shortage
Computer and Mathematical	3,555,462	87.4%	-452,611*	-395,582*
Architecture and Engineering	2,384,725	94.2%	539,586	508,290
Life, Physical, and Social Science	1,133,736	86.8%	-2,288*	-1,986*
Healthcare Practitioners and Technical	7,887,464	95.8%	730,469	699,789
Total STEM Workers	16,898,509	92.8%	1,100,627	1,021,381

*Indicates a labor surplus

AAF finds that the U.S. will be short roughly one million U.S. citizen STEM workers by 2024. However, this shortage is not consistent across all STEM occupations. Table 2 shows that the shortage of U.S. citizens working in health care, architecture, and engineering STEM occupations is expected to reach over 1.2 million by 2024. Conversely, AAF projects a surplus of almost 400,000 U.S. citizen STEM workers in occupations related to computer, mathematics, and life, physical, and social science.

Health care occupations have experienced rapid, sustained growth in recent years and are a driving force behind the STEM shortage.^{vi} Growth in nurse practitioners alone is projected by BLS to reach 35.2 percent from 2014 to 2024.^{vii} Similarly, the number of physical therapists and physician’s assistants are projected to rise by over 30 percent each.^{viii} This may help to explain the expected shortage of almost 700,000 U.S. citizens in STEM healthcare occupations by 2024. Some STEM occupations with projected surpluses, like sociologists and related workers, are expected to contract over the next decade.

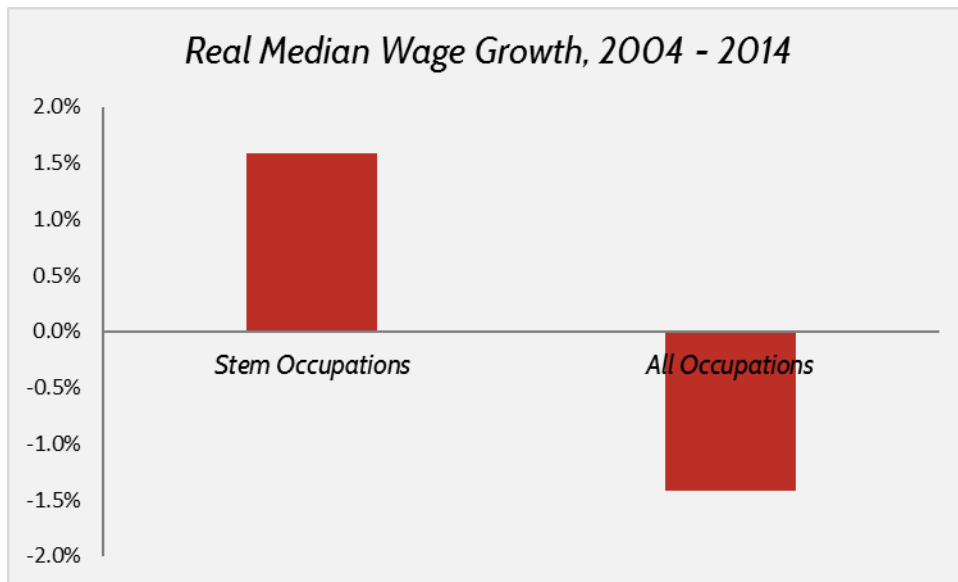
The citizenship status of STEM workers can also help to explain inconsistencies across occupational groups. For instance, 12.6 percent of Computer and Mathematical workers in 2014 were not U.S. citizens, while only 4.2 percent of



health care workers were the same. This suggests that occupations with more foreign workers may be less likely to experience shortages than those that rely heavily on U.S. workers.

Wages of STEM Workers

Several previous studies have argued against the existence of a STEM worker shortage by analyzing wage trends.^{ix} They argue that, in the absence of rapid wage growth, employer demand for STEM workers cannot be rising. However, the following chart tells a different story.



AAF analyzed annual STEM wages from 2004 to 2014 to further investigate the STEM worker shortage. In this case, high salaries for some STEM occupations may inflate the average wage of STEM workers. Median wages are therefore a more appropriate indicator to examine.

When compared to all occupations, STEM workers' median wages have grown significantly. From 2004 to 2014 the median wage of STEM workers increased 1.6 percent.^x And while an increase of under two percent across ten years may not seem substantial, the median wage of all occupations during that same time decreased 1.4 percent.^{xi} This provides further evidence that STEM workers are highly demanded by employers and not currently in sufficient supply.

Implications

The native STEM worker shortage has direct implications on U.S. immigration policy, especially for foreign students entering the H-1B program. The U.S. higher education system is rich with international students; almost one million were enrolled during the 2014-15 academic year.^{xii} Furthermore, the Optional Practical



Training (OPT) program gives these students an opportunity to stay in the U.S. for up to one year after graduation. OPT allows foreign graduates to work or intern at a U.S. company for a limited time to gain experience related to their field of study. Until recently, international students with STEM degrees were eligible for an additional 17 months of OPT. This provides them with more time to contribute their valuable skills to our economy and find an employer willing to sponsor them as H-1B workers. This month the [Department of Homeland Security](#) increased the OPT extension to 24 months so that international STEM students can stay, train, and look for employment in the U.S. for up to three years after graduation.

The additional extension for STEM graduates is a positive update to the OPT program. Currently, the process by which employers hire H-1B workers is very costly, involving enormous paperwork burdens and [thousands of dollars](#) in fees. Extending the amount of time recent STEM graduates have to stay in the U.S. will give them a better opportunity to match with a willing employer and positively contribute to American business.

Current legislation proposed by Senators Ted Cruz and Jeff Sessions would eliminate the OPT program and make it significantly more difficult for employers to hire H-1B workers.^{xiii} Eliminating OPT would mean that U.S. academic resources would be devoted to developing international students without giving those students an opportunity to enrich the American workforce. Given the value of STEM workers in today's economy and the projected native STEM shortage, both OPT and the H-1B program are worth preserving.

Conclusion

There is solid evidence of a U.S. STEM shortage, and the value of foreign workers is significant. America will not be able to sustain its current workforce with birth rates unable to replace the population.^{xiv} And the general consensus of existing literature is that increased immigration levels boost economic activity and raise native wages.^{xv} This suggests that legislation should be enacted to expand legal immigration, filling labor shortages now and in the future.

ⁱ For example, <http://www.brookings.edu/research/interactives/2014/job-vacancies-and-stem-skills#/M47900> and <http://cis.org/no-stem-shortage>

ⁱⁱ http://www.bls.gov/soc/Attachment_C_STEM.pdf

ⁱⁱⁱ <http://data.bls.gov/projections/occupationProj>

^{iv} <https://cew.georgetown.edu/wp-content/uploads/2014/11/stem-complete.pdf>

^v <http://www.nber.org/cps/>

^{vi} <http://www.bls.gov/careeroutlook/2014/spring/art03.pdf>

^{vii} <http://data.bls.gov/projections/occupationProj>

^{viii} *Ibid.*

^{ix} For example, <http://www.epi.org/publication/pm195-stem-labor-shortages-microsoft-report-distorts/> and <http://cis.org/no-stem-shortage>

^x <http://www.bls.gov/oes/tables.htm>

^{xi} *Ibid.*



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- xii <http://www.iie.org/Who-We-Are/News-and-Events/Press-Center/Press-Releases/2015/2015-11-16-Open-Doors-Data>
- xiii <http://americanactionforum.org/insights/impact-of-anti-immigrant-bills-could-cost-340000-jobs>
- xiv <http://www.prb.org/Publications/Datasheets/2014/2014-world-population-data-sheet/us-fertility-decline-factsheet.aspx>
- xv See <http://www.nber.org/papers/w12497.pdf>, http://www.manhattan-institute.org/pdf/ib_18.pdf, and <http://americanactionforum.org/sites/default/files/AugustImmigrationPacketFINAL.pdf>