UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

WASHINGTON ALLIANCE OF TECHNOLOGY WORKERS, Plaintiff, v. DEPARTMENT OF HOMELAND SECURITY, et al., Defendants.	**Civil Action No. 1:16-cv-1170**

BRIEF OF FWD.us, 52 COMPANIES, AND 11 INDUSTRY ASSOCIATIONS REPRESENTING MORE THAN 500 ADDITIONAL COMPANIES AS AMICI CURIAE IN SUPPORT OF INTERVENORS

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Apple

Asana

Betterment

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BSA | The Software Alliance

Colorado Business Roundtable

Compete America Coalition

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VMware, Inc.

Warby Parker

Zillow Group

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INTEREST OF AMICI CURIAE[1]

Amici comprise an array of diverse companies and organizations. Though they have many differences—some are competitors, many work in unrelated industries—all stand together in recognizing the importance to the American economy of science, technology, engineering, and mathematics (STEM) in general, and the optional practical training (OPT) and STEM OPT programs in particular. Today, companies in every industry and geography and of every size, whether formally given the "tech" label or not, depend on workers trained in STEM fields to succeed. But American companies are facing a sustained scarcity of STEM-trained workers in the United States. Companies, including amici, consistently struggle to fill STEM jobs and often face significant and persistent vacancies. The OPT and STEM OPT programs are critical to addressing that deficit. As amici have seen firsthand, these essential programs mitigate the immediate shortfall of STEM-skilled individuals, while ameliorating that problem in the long term, by educating and training the next generation of STEM workers. Eliminating these programs would cause substantial and unnecessary hardship to amici, their employees, and the U.S. economy. Amici therefore come together to urge this Court to uphold these vital programs.

I. The U.S. Economy Relies On Contributions Of Foreign Professionals To Flourish.

A. OPT and STEM OPT benefit the U.S. economy, businesses, and workers.

1. OPT and STEM OPT mitigate a growing scarcity in the labor market.

The STEM workforce is critical to the American economy.[2] A broad range of qualified "high-skilled professionals working in the sciences and engineering are fundamental to driving

[1] No counsel for a party authored this brief in whole or in part. No party, counsel for a party, or any person other than amici and their counsel made a monetary contribution to fund the preparation or submission of the brief.

[2] *See, e.g.*, *Maintaining U.S. Leadership in Science and Technology: Hearing Before the H. Comm. on Sci., Space & Tech.*, 116th Cong. 1 (2019) (statement of Hon. Patrick D. Gallagher, Chancellor, University of Pittsburgh) ("Gallagher Statement") ("Without exaggeration, the United States today owes much of its current economic

innovation, technological adoption, and productivity."[3] As more and more companies in more and more sectors incorporate cutting-edge technology into their products and services, a growing number of positions call for STEM skillsets, including many in industries outside traditional science and technology fields.[4] It is therefore increasingly the case that STEM "knowledge and skills are critical to an extensive portion of the *entire* U.S. workforce."[5]

Though STEM work is crucial to the country's short- and long-term economic prospects, the United States is currently experiencing a scarcity of STEM workers,[6] illustrated by both economy-wide statistics and the experiences of the amici in trying to fill important STEM positions in their own companies. While the overall unemployment rate is low, at 3.3% in

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leadership, military superiority, high standard of living, health and safety infrastructure for our citizens, energy security, and our dominant geopolitical leadership position to [science and technology] investments."); Jonathan Rothwell, Brookings Inst., *Still Searching: Job Vacancies and STEM Skills* 2 (2014) ("Workers with skills in [STEM] play a hugely important role in driving innovation and economic growth.").

[3] FWD.us & Orrin G. Hatch Foundation, *Barriers to Recruiting and Retaining Global Talent in the U.S.* 3 (2019); *accord* Nat'l Sci. Bd., Nat'l Sci. Found., *Revisiting the STEM Workforce* 3 (2015) ("*Revisiting the STEM Workforce*").

[4] *See, e.g.*, Nat'l Acads. Sci., Eng'g, & Med., *Graduate STEM Education for the 21st Century* 30 (Leshner & Scherer eds., 2018) ("STEM graduate degrees holders are increasingly in demand in traditionally non-STEM fields, such as policy, law, media and communications, nonprofits, and government."); Rothwell, *supra* n.2, at 1 ("As economies have developed in wealth and complexity …, scientists, engineers, and other STEM workers have grown in relative importance as a share of the labor market, and STEM skills are widely needed across a wide variety of blue-collar, craft, and professional occupations."); *Border Security, Economic Opportunity, and Immigration Modernization Act: Hearing on S.744 Before the S. Comm. On the Judiciary*, 113th Cong. 3 (2013) (written testimony of Brad Smith, General Counsel and Executive Vice President of Legal and Corporate Affairs, Microsoft Corporation) ("Smith Testimony") ("Increasingly, every company is at least in part a software company.… As the use and insights from data pervade new areas, companies across our economy will need people to create and use these Big Data systems.").

[5] *Revisiting the STEM Workforce*, *supra* n.3, at 3.

[6] ACT, *STEM Education in the U.S.: Where We Are and What We Can Do* 1 (2017) ("[T]he United States is a STEM-deficient nation.… [N]ot enough U.S. students are equipped for STEM opportunities—now or in the future."); Cameron Evans et al., *Closing the Gap: Addressing STEM Workforce Challenges*, EduCause Rev., May/June 2013, at 64, 64 ("[T]o harness the promise of technology to deliver improved educational outcomes and sustained economic growth …, the United States must face a critical workforce-development challenge: in the country today, there are simply not enough people with the high-tech skills needed to fill open positions in tech-dependent fields.").

October 2019, unemployment numbers in STEM fields are markedly lower: Unemployment in computer, mathematical, architecture, and engineering occupations is at 2.2%, while unemployment among life and physical science occupations is at a strikingly low 1.4%.[7] Significantly, job postings for STEM-related roles vastly outnumber the qualified individuals searching for work in STEM fields,[8] leading STEM vacancies to remain unfilled for more than twice as long as non-STEM jobs.[9] This dynamic imposes severe strains on industry,[10] as amici can attest to firsthand.

Put another way, both the statistics and amici's experience in the market demonstrate that there are many more open STEM positions in the United States than qualified STEM professionals looking for work, resulting in STEM jobs going unfilled for unusually long stretches of time. "There simply are not enough people with the necessary skills to meet th[e] burgeoning demand" for STEM workers.[11]

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[7] *See* Bureau of Labor Statistics, *Labor Force Statistics from the Current Population Survey*, https://tinyurl.com/y37psonn (last modified Nov. 1, 2019).

[8] Press Release, Conference Board, *Online Job Ads Decreased 157,700 in July* (Aug. 2, 2017), https://tinyurl.com/y4smkuvu (reporting that there were nearly five times as many advertisements for computer and mathematical science positions as job seekers in those fields: 510,000 ads compared to 110,300 unemployed); New Am. Econ. Research Fund, *The Cost of Removing Optional Practical Training for STEM Graduates* (Oct. 21, 2019), https://tinyurl.com/yxdyqbd5 ("[I]n 2016, there were 13 times more STEM jobs posted online than there were available unemployed STEM workers in the United States").

[9] *Revisiting the STEM Workforce*, *supra* n.3, at 9; *see also* Rothwell, *supra* n.2, at 1.

[10] *See, e.g.*, Society for Human Resources Mgmt., *The Global Skills Shortage: Bridging the Talent Gap with Education, Training and Sourcing* 3-4 (2019) (finding that 75% of employers struggling to recruit qualified candidates reported insufficient applicants qualified in areas like data analysis, science, and engineering, and 50% identified a worsening of the skills gap in recent years); Craig Giffi et al., *2018 Deloitte and the Manufacturing Institute Skills Gap and Future of Work Study* 4-5 (2018) ("[M]ost manufacturers believe that the No. 1 cause of the skills shortage is 'shifting skill set due to the introduction of new advanced technology and automation[.]'"); Smith Testimony, *supra* n.4, at 3 ("Like other employers with high skilled job openings around the country, Microsoft has been confronting the challenge of finding workers for our open jobs in a labor market where the necessary skills are in short supply.").

[11] Smith Testimony, *supra* n.4, at 16.

This mismatch between the supply of STEM-trained individuals and demand for their skillsets is largely attributable to the insufficient numbers of U.S. workers with STEM educational background or training.[12] Insufficient numbers of U.S. high school graduates are ready to pursue STEM degrees in college, with only 40% of high school grads meeting college-level readiness benchmarks in math and 36% in science.[13] Worse yet, the number of native high school students studying crucial STEM subjects like computer science is decreasing.[14] Those low college-readiness numbers are matched by similarly low college graduation rates across STEM fields.[15] As a result, there are "too few American students … achieving the levels of education required to secure jobs in innovation-based industries."[16]

Moreover, disproportionate numbers of the relatively few STEM degree recipients in the United States are not native. Among STEM graduates in the United States, about 7% of bachelor's recipients are international students, while a whopping 53% of master's recipients and

[12] Evans et al., *supra* n.6, at 1 ("By the end of the decade, the U.S. economy will annually create 120,000 new jobs requiring a bachelor's degree in computer science, yet the country's higher education system is currently producing only 51,000 such degrees per year." (footnote omitted)).

[13] ACT, *The Condition of College and Career Readiness National 2018*, at 4 (2018); *see also Maintaining U.S. Leadership in Science and Technology: Hearing Before the H. Comm. on Sci., Space & Tech.*, 116th Cong. 1 (2019) (statement of Rep. Eddie Bernice Johnson, Chairwoman, H. Comm. on Sci., Space & Tech.) ("Our students have not shown improvements in math or science assessments in the last decade, and they continue to perform well behind the average for the top performing countries internationally.").

[14] Smith Testimony, *supra* n.4, at 5.

[15] *See* Nat'l Ctr. for Educ. Statistics, U.S. Dep't of Educ., *STEM Attrition: College Students' Paths into and out of STEM Fields*, at iv (2013) (describing attrition rates of 48% among bachelor's degree students and 69% of associate's degree students initially pursuing STEM education).

[16] Smith Testimony, *supra* n.4, at 16; *see also, e.g.*, Giffi et al., *supra* n.10, at 5 ("[M]anufacturers find themselves in the midst of the Fourth Industrial Revolution, one that is defined by its use of advanced technology to transform work throughout an organization.… In the presence of increased human-machine teaming and access to insights surfaced via the Internet of Things (IoT), the types of skills that employees need to possess are rapidly evolving, and it seems increasingly difficult for the workforce to keep pace.").

43% of Ph.D. recipients are international.[17] Most dramatically, roughly 80% of full-time graduate students in electrical engineering and computer science are international.[18] This means that, without a bridge status allowing international students to complete their education through practical experience, significant numbers of recipients of STEM degrees in the United States must leave the country after receiving their degrees.[19]

This shortfall is projected to worsen over time. The number of jobs requiring STEM literacy is expected to skyrocket over the next decade.[20] At the same time, a variety of factors are depressing the number of STEM students in the United States—including foreign STEM students—causing those numbers to stagnate or even decline.[21] Notably, because U.S.-educated STEM students are disproportionately foreign born, growing international competition for such

[17] *See* Nat'l Ctr. For Educ. Statistics, U.S. Dep't of Educ., *Digest of Education Statistics 2018*, at Table 318.45 (2019); *accord*, Madeline Zavodny, Nat'l Found. for Am. Policy, *International Students, STEM OPT and the U.S. STEM Workforce* 11 (2019).

[18] Stuart Anderson, Nat'l Found. for Am. Policy, *International Students and STEM OPT* 6 (2017) ("*International Students and STEM OPT*").

[19] *See, e.g.*, Evans et al., *supra* n.6, at 1 ("[T]hough foreign nationals represent a significant portion of graduate students in STEM fields, including 49 percent of all students enrolled in computer science programs, restrictive high-skilled immigration policies often force U.S.-educated foreign STEM students to leave the United States after graduation." (footnote omitted)).

[20] *See, e.g.*, Bureau of Labor Statistics, *Computer and Information Technology Occupations*, https://tinyurl.com/n2jxmwd (last modified Sept. 4, 2019) ("Employment of computer and information technology occupations is projected to grow 12 percent from 2018 to 2028, much faster than the average for all occupations. These occupations are projected to add about 546,200 new jobs."); Smith Testimony, *supra* n.4, at 4 ("[H]igh skilled jobs in today's modern economy increasingly are requiring an education in STEM fields. These types of occupations … are experiencing some of the fastest growth rates in new job openings and compensation, particularly in the highest demand STEM fields like computer science.").

[21] *See, e.g., Maintaining U.S. Leadership in Science and Technology: Hearing Before the H. Comm. on Sci., Space & Tech.*, 116th Cong. 4 (2019) (statement of Marcia K. McNutt, President, National Academy of Sciences) ("The most recent data … indicate a continued decline in temporary visa holder enrollment in 2018 …., with some of the sharpest drops in engineering and physical and earth sciences. For example …, international applications to U.S. physics Ph.D. programs declined an average of 12 percent in 2018."); Julie Baer, Inst. for Int'l Educ., *Fall 2018 International Student Enrollment Hot Topics Survey* 3 (2018), https://tinyurl.com/y4t86q6m (identifying declines in new foreign student enrollment in U.S. academic institutions of 3.3% in 2016, 6.6% in 2017, and 1.5% in 2018).

students has and will continue to diminish the overall numbers of STEM graduates in the U.S. labor pool. Other nations are deliberately liberalizing their immigration laws and increasing their outreach to foreign-born students and workers, making those countries more attractive to such candidates when they are deciding where to pursue their education and initial professional opportunities.[22] For instance, Australia permits international students in certain high-need fields to work for up to four years following their graduation; Canada allows international students to work after graduation for a period of time equal to the length of their academic study; China allows international students with a master's degree or higher to apply for work visas within one year of graduating; and India recently launched an initiative to attract 200,000 international students to Indian universities by offering scholarships.[23] As foreign-born STEM students are increasingly drawn to other countries with more accessible educational and professional opportunities for high-skilled foreign students and workers, the number of STEM graduates in the United States will fall still further, increasing the disparity between the number of jobs requiring STEM literacy and the number of those qualified to fill the roles.

A benefit of STEM OPT is that it addresses the STEM scarcity in the labor market by creating a recruiting opportunity and a crucial pipeline of talent to fill companies' needs across

[22] *See, e.g.*, FWD.us & Orrin G. Hatch Foundation, *supra* n.3, at 10 ("[M]any other countries, including Germany, Australia, Canada, and Singapore, have few limitations on high-skilled immigrant worker visas and have clear avenues to legal permanent residency for those high-skilled workers.… [O]ther countries are streamlining their processes to attract quality talent and admit them quickly and easily."); Gallagher Statement, *supra* n.2, at 6.

[23] *U.S. at Risk of Losing the Benefits of Talented International Students*, NAFSA, https://tinyurl.com/u3bb4rw (last visited Nov. 21, 2019) ("[M]any other countries are proactively introducing national policies and marketing strategies in order to attract these talented individuals."); NAFSA, *Losing Talent: An Economic and Foreign Policy Risk America* Can't *Ignore* 10 (2019).

industries.[24] The STEM OPT extension provides an attractive prospect for foreign-born students who wish to gain additional knowledge in the United States in their fields of study following conferral of their degrees, enhancing the United States' ability to vie for those students with competitor countries.[25] It creates opportunities for highly skilled foreign-born students to work for U.S. companies in the short term, augmenting their scholastic education with a practical education. And it enables companies to play a critical role in that continuing education, recruiting STEM workers in the short- and medium-term, and evaluating them over the duration of their practical training to assess whether they would make valuable contributors to the company over the long-term.[26] Moreover, an immediate termination of the OPT and STEM OPT programs could mean removing participants from their current jobs and ordering them removed from the United States. This would harm both the employees and their employers, who would then have to scramble to find replacements for those qualified workers who were hired because they were the best fit for the job.

2. OPT and STEM OPT bring international talent to American workplaces, benefiting the U.S. economy, the companies for which they work, and native workers.

In addition to filling existing vacancies and continuing STEM graduates' education through apprenticeship, the introduction of international STEM graduates into the labor market

[24] Jeremy L. Neufeld, *Optional Practical Training (OPT) and International Students After Graduation* 2 (Niskanen Center Research Paper, 2019) ("[T]he OPT program can accurately be described as the largest high-skilled worker *recruitment* program in the country.").

[25] Business Roundtable, *The Economic Impact of Curbing the Optional Practical Training Program* 12 (2018) (describing OPT as a "key component" of the United States' strategy "to encourage international students to come to America to study and work"); *cf. id.* at 2 ("Modifications to OPT that make the program less attractive to international students and graduates would not only reduce participation but also deter some international students from coming to the United States to study given that they would have fewer avenues for postgraduate employment.").

[26] Zavodny, *supra* n.17, at 2, 18.

has myriad systemic economic benefits. Notably, participation in the STEM labor market is not zero sum.[27] For one thing, "we are not dealing with a choice between hiring U.S. workers and hiring foreign workers" because the "talent shortage is so acute that we need *both* to address today's workforce needs."[28] In fact, hiring foreign-born workers actually expands job opportunities for American workers. The economic activity spurred when a qualified candidate fills an open high-skill job creates many more jobs across the local economy, in what is known as a "multiplier effect"[29]: It is well documented that filling a high-skill job in a STEM field like engineering or computer science with a foreign-born worker creates nearly two additional jobs *in that same field*, by "raising production and productivity in the firm" and "allow[ing] the firm to expand and hire more workers to handle new tasks related to the increased productivity."[30] In other words, "immigrants help native-born workers by increasing the size of the economic pie, rather than simply competing for a slice."[31]

The increase in productivity driven by foreign-born workers, in turn, drives up wages throughout the relevant market, particularly among college-educated native workers: A "1

[27] Giovanni Peri, Kevin Shih & Chad Sparber, *Foreign and Native Skilled Workers: What Can We Learn From H-1B Lotteries?* 28 (NBER Working Paper No. 21175, 2015) (when H-1B visas decline in a given jurisdiction, "the employment [opportunities] and wages of natives in similar occupations was at best unchanged and at worst harmed," because "H-1B workers complement native computer workers and/or increase the productivity of the firm").

[28] Smith Testimony, *supra* n.4, at 14.

[29] *Id.* at 3; *see also, e.g.*, *id.* at 9 ("[F]or every job created in the high tech sector, an additional 4.3 jobs emerge over time in the local economy.").

[30] David Bier, Niskanen Center, *H-1Bs Don't Replace U.S. Workers* 1, 4, 8 (2015) ("[T]he entrance of a single foreign-born worker into … engineering and computer-related fields … is associated with an increase of nearly two jobs overall in those industries."); Giovanni Peri et al., P'ship for a New Am. Econ., *Closing Economic Windows: How H-1B Visa Denials Cost U.S.-Born Tech Workers Jobs and Wages During the Great Economic Recession* 5-6 (2014).

[31] Business Roundtable, *supra* n.25, at 4.

percentage point increase in the foreign STEM share of a city's total employment increased the wage growth of native college-educated labor by about 7-8 percentage points and the wage growth of non-college-educated natives by 3-4 percentage points."[32] Foreign-born STEM workers "spur economic growth by increasing productivity, especially that of college-educated workers."[33] Across the economy, "a 1 percent increase in the population of immigrants in the United States is associated with a 1.15 percent gain in GDP."[34]

Moreover, foreign-born STEM workers disproportionately "are essential leaders of and contributors to the innovation and entrepreneurial activity of our nation."[35] Although immigrants constitute only 15% of the workforce,[36] 55% of $1 billion startup companies in America had at least one immigrant cofounder; of those startups, nearly one quarter were founded by immigrants who first came to the United States on an F-1 student visa; and immigrants started 33% of U.S. venture-backed companies that became publicly traded between 2006 and 2012.[37] Immigrants are twice as likely as native-born workers to become entrepreneurs.[38]

[32] Giovanni Peri, Kevin Shih & Chad Sparber, *STEM Workers, H-1B Visas, and Productivity in U.S. Cities*, 33 J. of Labor Econ. S225, S252 (2015).

[33] *Id.*

[34] Business Roundtable, *supra* n.25, at 3; *see also* Diana Furchtgott-Roth, Manhattan Institute, *Does Immigration Increase Economic Growth*? 10 (2014).

[35] Smith Testimony, *supra* n.4, at 10.

[36] Business Roundtable, *supra* n.25, at 4.

[37] *Id.* at 11; Stuart Anderson, Nat'l Fed. for Am. Policy, *Immigrants and Billion-Dollar Companies* 1-2 (2018).

[38] Robert Fairlie, Sameeksha Desai & A.J. Hermann, Ewing Marion Kauffman Foundation, *2017 National Report on Early-Stage Entrepreneurship* 10 (2019); Business Roundtable, *supra* n.25, at 11.

Early studies about the effects of the STEM OPT extension indicate that it offers the same benefits as high-skilled immigration generally.[39] For instance, unemployment rates are lower in areas with larger numbers of STEM OPT participants as a share of workers in STEM positions.[40] In addition, studies have documented that greater numbers of OPT participants, who tend to bring a greater diversity of backgrounds and perspectives to the STEM workforce, correlate to "large[] positive effects on earnings for college-educated residents."[41] OPT participants have "statistically significant positive effects" on the number of patents filed: Every ten additional OPT participants in an area "leads to about five additional patents originating in" that area, through "some combination of direct innovation by OPT participants and indirect spillover effects caused by a larger supply of highly educated workers."[42] And, overall, the vast majority of employers of OPT participants report that those participants "contribute to the overall success of the organization, creating new job opportunities for U.S. and foreign national employees alike" and "work[ing] in conjunction with U.S. workers in a way that promotes career development for everyone involved."[43]

Amici's individual experiences illustrate the real-world benefits of OPT and STEM OPT. At Intel, for instance, a STEM OPT participant independently developed a sensor for detecting

[39] Neufeld, *supra* n.24, at 2-3 ("[T]he [OPT] program increases innovation, does not adversely affect natives on average, and increases the earnings of college-educated natives."); *id.* at 6.

[40] Zavodny, *supra* n.17, at 17.

[41] Neufeld, *supra* n.24, at 5. The effect on average earnings for all native workers is also positive, though not statistically significant (unlike the effect on average earnings for college-educated natives). *Id.*

[42] *Id.*; *see* Business Roundtable, *supra* n.25, at 4, 11; *see also, e.g.*, Jennifer Hunt & Marjolaine Gauthier-Loiselle, *How Much Does Immigration Boost Innovation?*, Am. Econ. J.: Macroeconomics, Apr. 2010, at 31, 52 ("[A] college graduate immigrant contributes at least twice as much to patenting as his or her native counterpart.").

[43] Council for Glob. Immigration & Soc'y for Human Res. Mgmt., Comments Regarding STEM OPT Proposed Rule/DHS Docket No. ICEB-2015-0002, at 2 (Nov. 18, 2015), https://tinyurl.com/yxw6nxae.

counterfeit microchips—a component with urgent significance for national security. Counterfeit chips—which can suffer from inconsistent performance, material, and characteristics—have been found in mission-critical military equipment, including U.S. Missile Defense Agency mission computers, ship-based aviation antenna equipment, and helicopter night-vision systems. This development was so concerning that it led the Senate Armed Services Committee to investigate counterfeit parts in the Department of Defense supply chain. The sensor developed by the Intel STEM OPT participant can detect these dangerous counterfeits with significantly higher precision, repeatability, and performance than conventional instruments.

B. Eliminating OPT and STEM OPT would hurt American workers.

WashTech and the other opponents of the Final Rule generally do not dispute that OPT and STEM OPT provide all the economic upside discussed above. Instead, they discount those benefits as supposedly coming at the expense of the American worker. In particular, WashTech and its supporters argue that OPT and STEM OPT create an incentive to hire foreign STEM graduates over native ones and thus exacerbate an *oversupply* of STEM workers in the American economy. WashTech claims, therefore, that eliminating these programs will result in more jobs and higher pay for Americans. But the factual assertions underlying that argument rest on shoddy statistics and a misunderstanding of the American labor market. And, as the amici here can attest, they run directly contrary to the on-the-ground reality of American industry.

1. OPT and STEM OPT create jobs for American workers.

OPT and STEM OPT do more than merely provide employers with highly skilled labor for critical technical positions that would otherwise go unfilled; these programs also *create* jobs for American workers. Without OPT and STEM OPT, employers would suddenly find fewer STEM-educated persons to take positions in the United States for jobs that cannot be filled with native employees alone. For many employers, that deficit would be not only sudden but also

significant. One amicus, for instance, noted that because so few native workers have graduate degrees in computer science, about 45% of its new software engineers are filled by OPT or STEM OPT participants. A decline in STEM-educated workers in the United States would thus create strong economic pressure for companies to shift STEM jobs to other countries that either have a large preexisting pool of STEM workers (like India and China, which are home to the vast majority of foreign STEM students in the United States) or countries that are making deliberate efforts to attract foreign STEM students (like Canada and Australia).

As another amicus confirmed, eliminating OPT and STEM OPT would create the risk that companies will decrease hiring in the United States and increase hiring abroad. Recent interviews with employers "revealed that ending STEM OPT" would wreak significant harm on American companies, who would suddenly lose highly skilled employees in key technical positions, while also hurting native workers by potentially "caus[ing] U.S. tech companies to change recruiting practices," by "recruit[ing], hir[ing] and plac[ing] international students *outside* the United States."[44] Companies are already increasing their hiring abroad in response to immigration restrictions on high-skill professionals, with the "strongest" effect among "R&D-intensive firms."[45] Ending OPT and STEM OPT would only accelerate that trend.

Potential impacts would not be limited to STEM positions. If a software development office, for instance, is moved overseas, not only are the engineering positions sent abroad, but the nontechnical support roles (e.g., secretaries, janitors, and kitchen staff) are too, to say nothing of neighboring businesses that support that office and its employees. That effect is, in part, what

[44] *International Students and STEM OPT*, *supra* n.18, at 6.

[45] Britta Glennon, *How Do Restrictions on High-Skilled Immigration Affect Offshoring?* 26 (Carnegie Mellon Working Paper, May 2019), https://tinyurl.com/y2brtgfy.

led a Business Roundtable study to find that a 60% reduction in the OPT program would cost native workers 255,000 jobs (and foreign workers 188,000 jobs) by 2028.[46] The impact from those job losses would, in turn, ripple through the entire U.S. economy, causing the unemployment rate to rise 0.15 percentage points and average real hourly wages to fall by 17 cents over the same time period.[47]

Opponents of OPT and STEM OPT deny that those programs fill otherwise unfillable jobs, claiming instead that the programs shut native workers out of the labor market. That argument rests on the assertion that (contrary to all the evidence above, *supra* § I.A.1) there is not a scarcity of STEM workers in the American economy, but a *surplus*—one which OPT and STEM OPT exacerbate to the detriment of native laborers. *See* 81 Fed. Reg. 13,040, 13,052-53 (Mar. 11, 2016). As an initial matter, however, the claim of an oversupply of available STEM workers in the United States is completely contrary to the experience of the amici here.[48] Moreover, the (sole) study cited in support of the claimed STEM-worker surplus in fact shows no such thing.

The assertion that the U.S. economy faces an oversupply of STEM workers is based on a Census study purporting to show that a high percentage of U.S. STEM graduates are not employed in a STEM field. But that study employs a highly idiosyncratic definition of "STEM" that reflects neither the ordinary understanding of that term nor (more to the point here) the definition used by DHS in implementing the STEM OPT program. In fact, the Census study is

[46] Business Roundtable, *supra* n.25, at 8.

[47] *Id.* at 10; *see also* New Am. Econ. Research Fund, *supra* n.8 (finding that "the direct costs—the immediate loss of wages and the cost to rehire employees" of eliminating the STEM OPT extension "would total more than $130 million" in "just one year" (emphasis omitted)).

[48] WashTech's contention that OPT and STEM OPT participants are hired at the expense of native workers is addressed *infra* § I.B.2.

both under- and overinclusive in significant ways. And both of those distortions lead to a bottom-line statistic that vastly overstates the number of STEM graduates working in non-technical fields who WashTech then assumes are available to fill STEM jobs in the United States.

On underinclusiveness, the study's definition of "STEM" excludes popular professions that routinely require facility with science, technology, engineering, or mathematics, such as doctors, STEM professors, IP lawyers, and C-suite executives. According to the study, the top occupations for STEM graduates "not employed in STEM" were managers (692,000 STEM majors); physicians (594,200); postsecondary teachers (522,100); lawyers (442,900); elementary and middle school teachers (425,100); and chief executives (220,400).[49] In other words, many of the supposedly displaced STEM workers are biology or chemistry majors who go on to medical school, or mathematics or physics Ph.Ds. in tenure-track faculty positions—hardly people suffering from unemployment or underemployment because of foreign competition.

On the flipside, the Census study takes an extremely broad view of majors that qualify as "STEM," counting, for instance, anyone with a degree in "social science" as a STEM graduate.[50] In fact, social science graduates—who are understandably not included in DHS's definition of "STEM" in its administration of the STEM OPT program[51]—make up the second-largest cohort of "STEM" majors under the Census study's definition (21.6%), far outstripping "computers, mathematics, and statistics" majors (12.9%); "biological, agricultural, and environmental

[49] Liana Christin Landivar, U.S. Census Bureau, *The Relationship Between Science and Engineering Education and Employment in STEM Occupations* 11 (2013), https://tinyurl.com/r2qz346.

[50] *Id.*

[51] *See* Dep't of Homeland Sec., *STEM Designated Degree Program List Effective May 10, 2016* (2016), https://tinyurl.com/jrnbu7u.

sciences" majors (18.5%); and "physical and related sciences" majors (9.3%), and trailing only slightly behind engineering majors (22.5%).[52] As a result, the Census study serves as an exceptionally poor measure of what is generally understood to be the STEM labor market, let alone the industries affected by the STEM OPT program. That is especially true given that social science majors have dramatically lower rates of STEM employment than other categories of STEM majors, in part because the number of jobs in the social sciences is vastly smaller than the number in the hard sciences.[53] Between that disproportionately low employment rate and their disproportionately high representation among the study's sample of "STEM" graduates, social science majors significantly skew the overall statistics reported in the study.

Beyond the skewed statistics, WashTech's argument misunderstands why STEM graduates who work outside their field of study end up doing so. Opponents of OPT and STEM OPT assume that those STEM graduates must have been forced out of STEM fields by an excess of workers—such that a reduction in the number of OPT and STEM OPT participants would bring those native STEM graduates back into the fold. But that assumption is contradicted by the data and the experience of amici. A study by the National Science Foundation revealed that the rate of individuals with STEM degrees working out of their field *involuntarily* (i.e., the number forced out) was quite low: only 4% for those whose highest degree was in computer and mathematical sciences, and 3.2% for those whose highest degree was in engineering.[54] (The rate for individuals whose highest degree was in social sciences was many times higher.) That makes

[52] Landivar, *supra* n.49, at 11.

[53] *Id.* at 5. The STEM employment rate of social science majors is seven times lower than that of either engineering majors or computers, mathematics, and statistics majors. *Id.* at 13.

[54] Nat'l Sci. Bd., Nat'l Sci. Found., *Science & Engineering Indicators 2018: Science & Engineering Labor Market Conditions* tbl.3-12 (2018), https://tinyurl.com/y6ayvfy5.

sense: The "non-STEM" jobs that STEM majors are most commonly pursuing—prestigious (and generally lucrative) careers in medicine, law, business, and academia that require concerted effort and often additional years of education to achieve—are hardly the type one settles for out of desperation because of difficulty in finding gainful STEM employment.

At bottom, there is little support for the assertion that there is a glut of STEM workers in the U.S. economy, or that OPT and STEM OPT are making such an oversupply worse. In fact, a recent study that sought to measure the impact of OPT on the U.S. labor market found that of all the effects measured, including labor force participation rate, employment rate, and unemployment rate, none "is statistically different from zero, suggesting that OPT participants do not have adverse effects on aggregate labor market outcomes."[55] WashTech's crusade to extinguish the OPT and STEM OPT programs thus cannot be justified on grounds of protecting the American worker. As the data show that OPT and STEM OPT benefit native workers, those workers (whom WashTech claims it is seeking to protect) have little to gain, and much to lose, from the termination of the OPT and STEM OPT programs.

2. There is no incentive to hire STEM OPT students over American STEM workers.

As an initial matter, WashTech's worry that employers will preference STEM OPT participants over native-born workers is already obviated by federal law, as the STEM OPT program has an express non-displacement provision. Every employer that participates in STEM OPT must certify under penalty of perjury that the STEM OPT student "will not replace a full- or part-time, temporary or permanent U.S. worker." 8 C.F.R. § 214.2(f)(10)(ii)(C)(10)(ii); *see* U.S. Immigration & Customs Enforcement, Form I-983 (2019), https://tinyurl.com/y6k4x9se.

[55] Neufeld, *supra* n.24, at 6.

Nevertheless, WashTech frets that the protection of federal law is insufficient because, according to WashTech, STEM OPT participants are "inherently cheaper to employ" than similarly situated American workers. Compl. ¶ 221. That too is addressed by the Final Rule, which requires that "[t]he terms and conditions of a STEM practical training opportunity … including duties, hours, and compensation, must be commensurate with terms and conditions applicable to the employer's similarly situated U.S. workers." 8 C.F.R. § 214.2(f)(10)(ii)(C)(8).

Because the wages, hours, and benefits of STEM OPT participants are not cheaper than those of analogous U.S. workers, WashTech must base its argument solely on a purported second-order tax effect of STEM OPT participants' status as F-1 student visa holders. Foreign students cannot collect Social Security or Medicare, so they are exempt from taxes under the Federal Insurance Contributions Act (FICA), 26 U.S.C. § 3101 *et seq.*—the 6.2% Social Security and 1.45% Medicare payroll taxes—for their first five calendar years in the country. 26 U.S.C. § 3121(b)(19); *see* 26 C.F.R. § 31.3121(b)(19)–1; *id.* § 301.7701(b)–3(b)(4), (7)(iii). Thus, WashTech's argument goes, the tax savings motivate employers to disregard federal law and hire STEM OPT participants over native workers.

WashTech's argument, however, vastly overstates the financial impact of this minor tax exemption. For one thing, employers often have no idea that this FICA exemption even exists, or whether a particular job applicant qualifies for it—and so it does not (and cannot) factor into their hiring decisions. One amicus reports, for example, that its recruiting team and manager are wholly unaware of any FICA taxation rules for OPT and STEM OPT workers, so they have no incentive to treat those applicants differently. And even in the unlikely event that some recruiter happened to be aware of this obscure wrinkle in the tax code, they would not be able to do anything with it. That is because employers typically avoid asking about the details of a

candidate's immigration status during the recruiting process, and thus recruiters are unlikely to know at the time of hiring whether a candidate is a STEM OPT participant, let alone whether the candidate qualifies for a FICA tax exemption.

The time-limited nature of the tax exemption also means that for many F-1 students it will result in virtually no tax savings during their OPT and STEM OPT extensions. That is because the FICA exemption applies only during the first five calendar years that an F-1 visa holder is in the country—which means that for many OPT and STEM OPT participants, all or nearly all of that tax-exempt time will be exhausted while they are in school and thus before they begin work. Take, for example, an F-1 student who comes to the United States to pursue a Ph.D.—which, according to a recent study by the National Science Foundation, takes on average 5.8 years.[56] The entirety of her five-year FICA exemption is likely to be exhausted before she participates in the OPT or STEM OPT extensions—so any employer sponsoring such an extension will receive no tax savings as a result of her visa status. Similarly, the employer of an F-1 student who completes a standard four-year undergraduate program will also see virtually no tax savings, because the four academic years spent pursuing that degree will span most of the five *calendar* years in which the student is FICA exempt.[57]

Meanwhile, any employer can tell you that hiring OPT and STEM OPT students often results in additional costs for employers that more than offset any minimal payroll tax savings

[56] Nat'l Ctr. for Sci. & Eng'g Statistics, Nat'l Sci. Found., *Science & Engineering Doctorates: Data Tables* tbl.31 (2018), https://tinyurl.com/yxssbcxm. Although the mean time to graduation can vary slightly by subject area, all STEM fields report an average program length of greater than five years. *See id.*

[57] Take for example a student who begins school in September 2007, graduates in June 2011, and then begins OPT training with an employer in August 2011. Her FICA exemption would expire in December 2011 (at the end of her fifth calendar year in the country)—meaning that it would cover only the first five months of her employment. At a starting salary of $70,000—a figure exceeding the average for new STEM graduates in 2019—that would amount to a savings to the employer of only $2230. *See* Kevin Gray & Andrea Koncz, Nat'l Ass'n of Colleges & Emp'rs, *STEM Majors Projected to Earn Top Salaries from Class of 2019* (Jan. 15, 2019), https://tinyurl.com/y6zk23rp.

from the FICA exemption. As DHS noted in promulgating the Final Rule, employers who wish to hire F-1 visa holders face additional "administrative costs, legal fees, and staff time related to securing the authority under U.S. immigration law to employ the foreign-born worker." 81 Fed. Reg. at 13,058. This is particularly true now, because the Final Rule imposed additional requirements on employers seeking to participate in the program, including that they comply with enhanced integrity procedures, participate in E-Verify, and submit to DHS site visits.

WashTech's argument thus boils down to the supposition that, for the possibility of a modest-to-nonexistent financial benefit (which in many cases actually nets negative), employers might be willing to violate the immigration laws, perjure themselves, and risk not only expulsion from the STEM OPT program, but also significant fines. *See* 18 U.S.C. §§ 1621, 3571(c)(3). Unsurprisingly, WashTech's argument is inconsistent with the on-the-ground reality. Amici state here clearly that the possibility that a job candidate might have FICA-exempt status simply does not impact employers' hiring decisions, let alone lead them to prefer foreign workers over native ones. And that's not just these amici. As one recent survey of employers reported: "In practice, company human resources executives say that the demand for tech and science talent is so great that when they find both a qualified U.S. applicant and another that is a foreign national they would offer jobs to *both* individuals."[58]

In short, employers are not induced by the limited FICA exemption for F-1 visa holders to hire STEM OPT participants over native-born workers. So any argument that eliminating STEM OPT would somehow help American labor by leveling the playing field with foreign competitors is unfounded. Indeed, ending the programs would wreak significant harm on American workers by destroying jobs and suppressing wages. *Supra* § I.B.1.

[58] *International Students and STEM OPT*, *supra* n.18, at 9 (emphasis added).

II. OPT And STEM OPT Serve An Important Role In STEM Education

Just as important as meeting the U.S. economy's current need for STEM workers is ensuring that need will continue to be met well into the future. The OPT and STEM OPT programs play a critical role there, too, pushing forward cutting-edge research for the future generations of STEM students and providing crucial opportunities to crystalize classroom learning through hands-on experience.[59]

A recent poll of employers found that "93% view th[e STEM OPT] experience as vital to preparing students for the U.S. workforce."[60] That finding is unsurprising: There is widespread agreement that practical work experience plays an important role across all disciplines in higher education. In fact, a broad diversity of fields, from social work to engineering, have recognized that "[i]t is imperative that students in professional programs be able to put into practice what they have learned in the classroom."[61]

Most obviously, practical experience helps prepare students to transition from the classroom to industry. One common issue reported by companies is students who "are unable to make th[e] transition from theory to practice with confidence and effectiveness."[62] Exposing

[59] Although amici span the sectors of the American economy, they all agree on the importance of supporting STEM education. Beyond participating in the OPT and STEM OPT programs, many amici have launched additional initiatives to invest in STEM education in the United States. AMD, for instance, has helped to bring virtual and augmented reality into classrooms at MIT; Stanford; USC; UT Austin; Duke; Carnegie Mellon; Johns Hopkins; and Hunters Lane High School, a public school in Nashville. Similarly, Salesforce has invested more than $90 million in education grants and has partnered with local school districts in the San Francisco Bay Area to provide technology in classrooms; support math and science curricula; and attract, develop, and retain STEM teachers. *See, e.g.*, Press Release, Salesforce, *Salesforce Announces $18.2 Million in Grants to San Francisco and Oakland School Districts, Education Nonprofits* (Sept. 12, 2019), https://tinyurl.com/ufnogfr.

[60] Council for Glob. Immigration & Soc'y for Human Res. Mgmt., *supra* n.43, at 2.

[61] Jan Wrenn & Bruce Wrenn, *Enhancing Learning by Integrating Theory and Practice*, 21 Int'l J. of Teaching & Learning in Higher Educ. 258, 258 (2009), https://tinyurl.com/y6gtqz6k.

[62] *Id.*

students to real-world work experience can help address that problem by supplementing the usual theoretical coursework and "prepar[ing] workers to become professional practitioners in their chosen field."[63]

The benefits of practical training, however, go far beyond just creating more effective workers for industry. Even from a purely academic perspective, hands-on work has tangible benefits. In addition to "enhanc[ing] … work readiness," the combination of practical experience and classroom theory has been shown to increase students' "self-efficiency" and "reflexive capabilities."[64] For that reason, higher-education "[i]nstitutions are placing increased emphasis on facilitating the integration of theory and practical work experience" through "work placements, internships, and practicum."[65]

Those universities are also looking for applicants who have practical experience in their chosen field. Berkeley, for instance, emphasizes that its graduate programs are interested in candidates with "[w]ork experience, especially … [involving] responsibility for testing, designing, [or] researching," particularly "in an area similar to what [the student] wish[es] to study in graduate school."[66] Stanford, too, explains to students applying to its mechanical engineering graduate program that an important criterion in the admissions decision is "demonstrated engagement in mechanical engineering or other technical fields through work

[63] *Id.*

[64] Ly Thi Tran & Sri Soejatminah, *Integration of Work Experience and Learning for International Students: From Harmony to Inequality*, 21 J. of Studies in Int'l Educ. 261, 262 (2017), https://tinyurl.com/y2ebk8c2.

[65] *Id.*

[66] Univ. of Cal. Berkeley, Berkeley Graduate Division Admissions, *Writing the Statement of Purpose*, https://tinyurl.com/yxbtoaed (last visited Nov. 21, 2019).

experience."[67] Harvard Business School goes further and treats work experience as not just a factor, but a requirement for admission: Because its "MBA Program is designed for students who have full-time work experience before matriculation," those who apply without such experience are offered, at best, a "'deferred admission,' i.e. an offer of admission to a future class conditional upon acquiring full-time work experience."[68]

The benefits of such practical experience abound and are especially pronounced in the STEM fields. Research from the University of Chicago has demonstrated that "[s]tudents who physically experience scientific concepts understand them more deeply and score better on science tests."[69] Additionally, "[d]ata show[] that through hands-on instruction[], students in the STEM study environment achieved and acquired new vocabulary and mathematical concepts and understandings.[70] And a report prepared for the National Academy of Sciences concluded that "[p]ractical work" helps to "develop[] students' scientific knowledge" and is thus "an essential component of science teaching and learning."[71]

Practical work experience also helps ensure that STEM students are learning about the latest developments in their fields. As a study by the National University Continuing Education Association found, "Over half the technical knowledge or skill of engineers becomes obsolete in

[67] Stanford Mechanical Engineering, *Coterm Admissions*, https://tinyurl.com/y4cow9f5 (last visited Nov. 21, 2019).

[68] Harvard Business School, *Find Answers*, https://tinyurl.com/y2strldd (last visited Nov. 21, 2019).

[69] Jann Ingmire, *Learning by Doing Helps Students Perform Better in Science*, UChicago News (Apr. 29, 2015), https://tinyurl.com/y4ka6t5r.

[70] John Kyere, *Effectiveness of Hands-on Pedagogy in STEM Education* 41 (2016), https://tinyurl.com/v8yfbb9.

[71] Robin Millar, *The Role of Practical Work in the Teaching and Learning of Science* 20 (2004), https://tinyurl.com/y38vwgxr.

two to seven years."[72] That means that professors' knowledge can soon become outdated, and so, without some mechanism for continually updating it, the information they pass on to their students will quickly fail to reflect the cutting edge. Indeed, a study by the National Research Council found that university engineering curricula often do "not reflect the modern design practices used in most competitive companies," because faculty members "are rarely aware of the most recent design techniques."[73] "Connections to industry" can address that problem, by keeping faculty members up to date on the latest developments, and thus "are vital for a [university] program to remain an industry leader."[74]

Additionally, hands-on STEM experience in general—and the STEM OPT program in particular—can play a significant role in advancing the cutting edge of academic research. Of the top 200 employers of STEM OPT participants, 65 are major research universities, including MIT, Stanford, Harvard, Columbia, Berkeley, and Caltech.[75] That means that every year, thousands of F-1 visa holders take advantage of the STEM OPT program to spend extra time continuing the research that they began during their graduate studies—either their own research or that of a professor for whom they work as a research assistant or post-doc. Other students use their STEM OPT extensions to conduct research at prominent government research laboratories,

[72] Ahad S. Nasab & James H. Lorenz, *Merits of Faculty Internship in Industry—A Valuable Experience*, Proceedings of the 2003 Am. Soc. For Eng'g Educ. Annual Conference & Exposition 8.849.1, 8.849.1-.2 (2003), https://tinyurl.com/y5mbcr53 (citing Ernest T. Smerdon, *It Takes A Lifetime*, ASEE Prism, Dec. 1996, at 56).

[73] *Id.* at 8.849.2.

[74] Colin Gasper & John Lipinski, *Industry Experience: Enhancing a Professor's Ability to Effectively Teach in Higher Education*, 5 J. of Educ. & Hum. Development 63, 64 (2016).

[75] *See* U.S. Immigration & Customs Enforcement, *2017 Top 200 Employers for Science, Technology, Engineering and Mathematics (STEM) Optional Practical Training (OPT) Students*, https://tinyurl.com/y4dbbmc8 (last updated Sept. 12, 2019).

including Lawrence Berkeley National Laboratory, Argonne National Laboratory, and Los Alamos National Laboratory—all among the top 200 STEM OPT employers as well.[76]

Practical experience has the additional benefit of encouraging students with an interest in STEM to stick with their passions. As mentioned above, at 14-16, one major contributor to the scarcity of STEM workers in the U.S. economy is that many of those who graduate with a STEM degree choose to pursue a career in a different field.[77] Studies of that phenomenon indicate that the "problem may be attributed to the fact that [although] schools have … offered STEM" curricula, they have done so "without the use of … hands-on" experiences.[78] Research suggests that "[t]he use of more hands-on activities in the study of science and other related subjects could help increase the number of students entering and maintaining scientific careers, relieving the growing concern that North America is losing its leadership status in the international scientific community."[79] Simply stated: "Hands-on learning is one way to keep [students] interested in science," which in turn "increases the likelihood they will lean toward science based careers."[80]

The STEM OPT program thus provides a critical assist to classroom learning in training the next generations of STEM workers. It leads STEM students to cement the concepts they learned in their academic programs. It helps them make an eventual transition from academia to industry. And it makes them more likely to stick with STEM careers for the long haul.

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[76] *Id.* Other major research-focused STEM OPT employers include the National Institutes of Health, Massachusetts General Hospital, and Brigham and Women's Hospital. *Id.*

[77] Kyere, *supra* n.70, at 33.

[78] *Id.*

[79] *Id.* at 40 (citing Lesley F. Roberts & Richard J. Wassersug, *Does Doing Scientific Research in High School Correlate with Students Staying in Science?*, 39 Research in Sci. Educ. 251 (2009)).

[80] Joshua Zeluff, *Hands-on Learning and Problem Based Learning Are Critical Methods in Aiding Student Understanding of Alternative Energy Concepts* 9 (2011).

CONCLUSION

For the foregoing reasons, this Court should grant intervenors' motion for summary judgment and dismiss WashTech's challenge to the OPT and STEM OPT programs.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that I electronically filed the foregoing document with the Clerk of the Court using the CM/ECF system, which will send notification of such filing to all counsel of record.

Dated: November 25, 2019

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CERTIFICATE OF COMPLIANCE

This brief complies with the page limitation of Local Civil Rule 7(o)(4) because it contains 25 pages.

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