Global Talent Mobility, Innovation and Growth

Case Study: United States of America

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This report examines the recruitment and retention of highly skilled professionals and international students in the case of the United States of America (USA). The aim of this study is to foster a deeper understanding of the role that policy programs and industry strategies play in attracting and retaining migrant professionals in STEM (Science, Technology, Engineering and Mathematics).

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Key Messages

➢ **Due to the size of its economy, variety of opportunities, and culture of innovation, the U.S. is a top destination for global talent, despite the restrictive immigration system that creates hurdles for the talent looking to settle.**

The U.S. economy is both highly innovative and competitive, and is home to important technology as well as innovation clusters including Silicon Valley. The technology sector in the U.S. represents a substantial portion of the country's economy, creating job opportunities and contributing significantly to the country's GDP. The strength of the sector has been highlighted as it has quickly recovered from any losses resulting from the response to the outbreak of the COVID-19 pandemic and the political tension surrounding the 2020 presidential election. Global talent has been crucial to this endeavour, despite having to navigate a complex and uncertain immigration system to so. However, the U.S. stands to benefit from reform to ensure that global talent does not reconsider their choice of country. simply due to long waiting periods and visa processing times.

➢ **American immigration policies are highly politicized, which challenges government officials in the capacity to galvanize the required political will to introduce legislative changes, indicating a need for an incremental approach to reform.**

Despite the crucial role foreign-born workers play in STEM sectors, immigration is a deeply contested and polarizing political issue in the U.S., therefore there has been little bipartisan consensus on adopting policy changes in immigration. The innovation sector has managed to cope until now through various support channels, including public funding. While there are several ideas to overhaul the immigration system, it is clear from various attempts in the past – including the recently passed legislation, the *CHIPS and Science Act* – that if any changes are made, they may need to be incremental. Moreover, any initial change will need to provide early proof of success to demonstrate the need to continue in this endeavour.

➢ **The long-term effects of the COVID-19 pandemic highlight the need for a flexible and agile immigration system with mechanisms in place to respond to the changing labour market needs.**

The fact the U.S. has been able to rely on the reputation of its educational institutions and success of its innovation clusters to attract foreign talent, with little government assistance, highlights the resilience the innovation sector has built over the years. However, as the effects of the COVID-19 pandemic demonstrate their long-term outcomes, the U.S. would benefit from honing particular aspects of its immigration policies (e.g. creating exemptions for H-1B visas tied to STEM employers) to retain the talent brought in by the innovation sector. In doing so, the U.S. would ensure some level of protection to the economy when unexpected systemic shocks take place.

I. Economic Situation and STEM Sector

Prior to the outbreak of the COVID-19 pandemic in 2019, the United States (US) of America (USA) ranked first as the world's largest economy by nominal gross-domestic product (GDP).[1] It placed 15th on the Human Development Index and experienced a strong and continued average annual GDP growth of 2% per year.[2][3] While the spread of the virus had significant effects on economies around the world, the depth of the dent created on the U.S.' economy remains to be seen. The U.S.' nominal GDP marked 23 trillion USD in 2021.[4]

The U.S. economy is both highly innovative and competitive. On the 2019 Global Innovation Index, issued by the World Intellectual Property Organization (WIPO),[5] the U.S. rose in ranking to 3rd from previous 5 years where its ranking fluctuated from 4th to 6th, trailing only Sweden (2nd) and Switzerland (1st).[6] This did not change in 2020 despite the COVID-19 pandemic.[7] National, as well as global innovation, is strongly supported by the research activities and training of talent taking place in U.S. post-secondary institutions. American universities took five out of the top ten spots in the 2021 Quacquarelli Symonds (Q.S.) Top University Rankings.[8] This reflects both the research capabilities and global reputation of universities such as the Massachusetts Institute of Technology (MIT), Stanford University and others.

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[1] International Monetary Fund, "World Economic Outlook Database," October 2019, https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/index.aspx

[2] Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 582, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

[3] United Nations Development Programme, "2019 Human Development Index Ranking," Human Development Reports, 2019, http://hdr.undp.org/en/content/2019-human-development-index-ranking; OECD Data, "Life expectancy at birth," 2019, https://data.oecd.org/healthstat/life-expectancy-at-birth.htm

[4] International Monetary Fund, "GDP and Components," IMF Data, 2022, https://data.imf.org/?sk=388dfa60-1d26-4ade-b505-a05a558d9a42

[5] World Intellectual Property Organization, "Rankings," Global Innovation Index, 2019, https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII_2019_EN_English.pdf;
World Intellectual Property Organization, "Rankings," Global Innovation Index, 2017, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017.pdf;
World Intellectual Property Organization, "Rankings," Global Innovation Index, 2016, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2016.pdf;
World Intellectual Property Organization, "Rankings," Global Innovation Index, 2015, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2015-intro5.pdf

[6] World Intellectual Property Organization, "Rankings," Global Innovation Index, 2019, https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII_2019_EN_English.pdf

[7] World Intellectual Property Organization, "Rankings," Global Innovation Index, 2020, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

[8] QS Quacquarelli Symonds, "QS World University Rankings 2021," QS Top Universities, 2020, https://www.topuniversities.com/university-rankings/world-university-rankings/2021

Prior to the pandemic, the U.S. also placed 2nd on the 2019 Global Competitiveness Index, published by the World Economic Forum (WEF), with only one country – Singapore – ranking higher than the U.S., which had consistently placed in the top three throughout the previous five years.[9] The U.S. scored particularly high in business dynamism (1st), innovation (2nd), domestic market size (2nd), and financial system dynamism (3rd).[10] Furthermore, the U.S. ranked also 1st worldwide in the number of scientific publications; however, its overall spending on research and development (R&D) with approximately 2.7% of GDP was relatively low compared to other countries (ranked 11th globally) even after being increased from a low of 2.5% in 2004.[11] In 2019, U.S. overall competitiveness dropped from 1st to 2nd due to lowered rankings of the U.S. in the categories of human capital (55th), life expectancy (66.6 Years, 54th), and skills (9th).[12] Restrictive regulations on hiring foreign labour also had a significant impact on the U.S.' competitiveness, as the country ranked 31st.[13]

It is crucial to note that following the election of Donald Trump, the U.S. economy was affected by tighter international travel and immigration restrictions. In January 2017, the now-former president Trump instituted an executive order that banned foreign nationals from seven Muslim majority nations from visiting and immigrating into the U.S.[14] The list was expanded later and more countries such as North Korea and Venezuela were added.[15] In the context of generally increased travel restrictions due to the COVID-19 pandemic, the U.S. government under the Trump administration continued to focus its efforts to restrict immigration even further. In April 2020, the U.S. suspended the approval of new green cards, except for the

[9] Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
[10] Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 37 http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
[11] Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 585 http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
[12] Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 585 http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
[13] Klaus Schwab, *Global Competitiveness Report 2019*, Geneva: World Economic Forum, 2019, 37, 583 http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
[14] "Timeline of the Muslim Ban," *ACLU Washington*, Accessed September 2, 2020, https://www.aclu-wa.org/pages/timeline-muslim-ban
[15] Nazita Lajevardi, Kassra AR Oskooii and Loren Collingwood, "Biden reverses Trump's 'Muslim ban.' Americans support the decision," *Washington Post,* January 27, 2021, https://www.washingtonpost.com/politics/2021/01/27/biden-reversed-trumps-muslim-ban-americans-support-that-decision/

spouses of U.S. citizens and children, and young adults under the age of 21.[16] In June of that year, the government decided to suspend the issue of new H-1B, L-1 and J skilled temporary work visas based on claims to protect American employees and jobseekers.[17] Meanwhile, President Biden, newly elected in 2020, announced that his administration would revoke both regulations. In January 2021, the Biden administration withdrew the Muslim ban, arguing that it was "morally wrong" and "designed" to target primarily Black and Brown immigrants".[18] Biden also reopened the country in February 2021 to people seeking green cards[19] and ensured that the ban on the H-1B and other work-based visas expired later in March.[20]

Although Biden has eased his predecessor's immigration policies, the controls implemented under the Trump administration are thought to have hurt America's innovation sector and competitiveness. Without an open migration flow, firms find themselves increasingly unable to fill high-skilled positions using global talent. Moreover, tight migration policies carry with them a reputational risk that affects the country's attractiveness and competitiveness. The number of green card applications decreased by 17% between 2016 and 2019, while, during the same period, the number of applications for temporary visas saw a reduction of 17%.[21] Furthermore, between 2016 and 2018, applications for H-1B visas decreased by 19% while international applications for post-graduate business schools in the U.S. decreased by 11%.[22] These trends reflected then-prospective applicants' concerns and uncertainties about U.S. visa policies and broader American perspectives on immigration.[23] In fact, there is mounting statistical evidence that increasingly

[16] BBC News "Coronavirus: Trump signs order on immigration green card suspensions," *BBC*, April 23, 2020, https://www.bbc.com/news/world-us-canada-52391678
[17] Franco Ordonez, "Trump Freezes Green Cards, Many Work Visas Until End of Year," *NPR*, June 20, 2020, https://www.npr.org/2020/06/20/881245867/trump-expected-to-suspend-h-1b-other-visas-until-end-of-year
[18] Nazita Lajevardi, Kassra AR Oskooii and Loren Collingwood, "Biden reverses Trump's 'Muslim ban.' Americans support the decision," *Washington Post,* January 27, 2021, https://www.washingtonpost.com/politics/2021/01/27/biden-reversed-trumps-muslim-ban-americans-support-that-decision/
[19] Michael D. Shear, "Biden Revokes Trump's Pause on Green Cards," *New York Times,* February 24, 2021, https://www.nytimes.com/2021/02/24/us/politics/biden-immigration-trump.html
[20] Michelle Hackman, "Biden Administration to Allow Work-Visa Ban to Expire," March 31, 2021, https://www.wsj.com/articles/biden-administration-to-allow-work-visa-ban-to-expire-11617204628
[21] Sarah Pierce and Jessica Bolter, "Dismantling and Reconstruction the U.S. Immigration System: A Catalogue of Changes under the Trump Presidency," Washington D.C.: Migration Policy Institute, July 2020
[22] William Kerr, "America, don't throw global talent away," *Nature* 563 (November 2018): 445.
[23] William Kerr, "America, don't throw global talent away," *Nature* 563 (November 2018): 445.

restrictive policy measures resulted in some skilled talent relocating from the U.S. to Canada. Since 2017 there has been a 75% increase in U.S. residents entering their neighbouring country through Canada's Express Entry program for high skilled workers.[24] Furthermore, there has been a 128% increase in U.S. non-citizen residents receiving admission into Canada's Express Entry program.[25] Thus, restrictive immigration policies, coupled with limited skills in the U.S. domestic working population, stand out as key barriers to the U.S. maintaining its global competitiveness and its position as a global economic and innovation leader.

The technology sector in the U.S. represents a significant portion of the country's economy, employing over 12.1 million (7.7% of the nationwide workforce[26]) and generating 1.9 trillion USD (10% of the U.S. GDP) in 2019.[27] In this same year, the U.S. economy managed to create 307,000 new jobs in technology, as well as 13,400 new technology businesses and start-ups.[28] The largest technology sectors in the U.S. were IT services and custom software services (2.7 million employees), Research and Development (R&D-1.8 million employees), telecommunications (1.8 million employees), and tech manufacturing (1.2 million employees).[29] The internet sector has 6 million direct jobs, representing 4% of all jobs, and the sector indirectly supports another 13 million.[30] Employees in the digital economy earn more on average than their counterparts, earning an average of $132,223 USD compared to $68,506 USD in average earnings for Americans in 2017.[31]

[24] Zachary Arnold, "Canada's Immigration System Increasingly Draws Talen from the United States," Centre for Security and Emerging Technology, July 2020, https://cset.georgetown.edu/research/canadas-immigration-system-increasingly-draws-talent-from-the-united-states/
[25] Zachary Arnold, "Canada's Immigration System Increasingly Draws Talen from the United States," Centre for Security and Emerging Technology, July 2020, https://cset.georgetown.edu/research/canadas-immigration-system-increasingly-draws-talent-from-the-united-states/
[26] CompTIA, "Key Findings," Cyberstates, 2020, https://www.cyberstates.org/index.html#keyfindings
[27] CompTIA, "Key Findings," Cyberstates, 2020, https://www.cyberstates.org/index.html#keyfindings
[28] CompTIA, "Key Findings," Cyberstates, 2020, https://www.cyberstates.org/index.html#keyfindings
[29] CompTIA, "Key Findings," Cyberstates, 2020, https://www.cyberstates.org/index.html#keyfindings
[30] David Shepardson, "Internet sector contributes $2.1 trillion to U.S. economy: industry group," *Reuters*, September 26, 2019, https://www.reuters.com/article/us-usa-internet-economy/internet-sector-contributes-2-1-trillion-to-u-s-economy-industry-group-idUSKBN1WB2QB
[31] David Shepardson, "Internet sector contributes $2.1 trillion to U.S. economy: industry group," *Reuters*, September 26, 2019, https://www.reuters.com/article/us-usa-internet-economy/internet-sector-contributes-2-1-trillion-to-u-s-economy-industry-group-idUSKBN1WB2QB

The U.S. is also a worldwide leader in artificial intelligence (AI). International Business Machines Corporation (IBM) has the largest portfolio of any company in the world in AI patents with 8,290 inventions, followed by Microsoft with 5,930.[32] The University of California, the U.S. Navy, MIT, and Stanford University lead as the public institutions in the U.S. with the largest number of AI patents.[33] Of the top 20 universities by number of AI patents, the U.S. has 6 compared to the 10 registered for China, indicating that the U.S. is trailing behind China in AI development in academic institutions.[34] However, the U.S. still leads in the number of patent applications by patent office, and more than 2/3 of all companies acquired in the AI sector have been American companies.[35] In 2016, the American government released three strategy documents concerning AI development, including a national artificial intelligence R&D strategic plan.[36] In 2018, the U.S. government established a committee on AI to advise the White House on R&D priorities, and to support the government's goal of maintaining U.S. global leadership in AI.[37]

In 2020, the International Monetary Fund (IMF) forecasted that the U.S.' real GDP would decline by 8%,[38] highlighting the setbacks caused by the COVID-19 pandemic. In addition to the pandemic, President Trump's restrictions on immigration resulted in severe economic losses. For example, in June 2020, President Trump passed an Executive Order that slashed the number of visas available for highly skilled international workers.[39] Immediately after President Trump issued this order, the stock prices for the top 400 U.S. firms immediately fell by 0.45% or $100 billion, and these stock prices did not recover until at

[32] World Intellectual Property Organization, "Artificial Intelligence," *Technology Trends 2019*, 2019, 15 https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf
[33] World Intellectual Property Organization, "Artificial Intelligence," *Technology Trends 2019*, 2019, 62 https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf
[34] World Intellectual Property Organization, "Artificial Intelligence," *Technology Trends 2019*, 2019, 64 https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf
[35] World Intellectual Property Organization, "Artificial Intelligence," *Technology Trends 2019*, 2019, 86, 106 https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf
[36] *The National Artificial Intelligence Research and Development Strategic Plan*, National Science and Technology Council, October 2016, https://www.nitrd.gov/pubs/national_ai_rd_strategic_plan.pdf
[37] World Intellectual Property Organization, "Artificial Intelligence," *Technology Trends 2019*, 2019, 126 https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf
[38] International Monetary Fund, "World Economic Outlook Update, June 2020," World Economic Outlook Reports, June 2020, https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020
[39] Dany Bahar, Prithwiraj (Raj) Choudhury, and Britta Glennon, "Research: The Cost of a Single U.S. Immigration Restriction," *Harvard Business Review*, January 22, 2021, https://hbr.org/2021/01/research-the-cost-of-a-single-u-s-immigration-restriction.

least 10 days after the announcement.[40] Indicating the significance of highly skilled foreign workers in the U.S. economy. Unemployment also increased sharply, from 3.7% in 2019 to 11.0% in Spring 2020.[41] In the short term, U.S. economic policy would have to focus on supporting economic recovery and boosting job creation after the pandemic.[42] In 2020, 2.7 trillion USD in emergency funding was authorized to help struggling firms and workers.[43] The impact was amplified by the inability of the American healthcare system and the federal and state governments to cope with the spread of the virus. Officials were concerned that the U.S. economic decline might well go on if the pandemic continued unabated.[44] There was also a substantial amount of political risk in the short term as the country grappled with the economic and health-related impacts of the pandemic, and nationwide protests against racial bias in policing and police brutality in parallel.[45] It is also worth noting that the presidential elections in November 2020 and Trump's efforts to discredit the electoral process increased tensions in American society.[46]

Nevertheless, despite a series of concerns in response to the public health crisis and the political tension surrounding the presidential election, the recent U.S.' economy is regaining its strength. The 2021 IMF report announced that the U.S.' real GDP growth in 2020 resulted in only 4.9% of decline by estimation,[47] despite the projected ratio of 8% that was previously assessed in mid 2020. An analysis based on GDP, gross domestic income (GDI), and the gross domestic product price index, suggests that the Biden administration by far marks the best growth record since Bill Clinton as of September 2022 after the second-

Dany Bahar, Prithwiraj (Raj) Choudhury, and Britta Glennon, "Research: The Cost of a Single U.S. Immigration Restriction," *Harvard Business Review*, January 22, 2021, https://hbr.org/2021/01/research-the-cost-of-a-single-u-s-immigration-restriction.

[41] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, August 2020, 2

[42] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, August 2020, 2

[43] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, August 2020, 6

[44] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, August 2020, 2

[45] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, August 2020, 4

[46] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, April 30, 2021, 4

[47] International Monetary Fund, "World Economic Outlook Update, January 2021," World Economic Outlook Reports, January 2021, https://www.imf.org/-/media/Files/Publications/WEO/2021/Update/January/English/text.ashx

quarter economic growth numbers were published (although it is also noted that the differences in growth rates tend to be large for those with very short tenures such as Gerald Ford and Biden so far).[48]

In 2022, the White House reported that Americans had created 5.4 million new businesses across the country in 2021, which accounts for over 20% higher than any previous year on record and more than 2/3 higher than the annual average of new businesses applications per year in the five years prior to the start of the pandemic, 3.2 million.[49] They also inform that small businesses with less than 50 employees created 1.9 million jobs in the three-quarters of 2021, the fastest start to small business job growth in any year on record.[50] The U.S. Department of the Treasury claims in 2022 that one year after President Biden's American Rescue Plan Act, a 1.9 trillion USD economic stimulus bill against the pandemic, America is in the midst of one of the strongest periods of economic growth in a century.[51] The law resulted in 4 million more jobs and nearly doubled GDP growth, while making major progress against various problems such as child poverty, food insecurity, unemployment for low-income communities and communities of colour.[52] The Economist Intelligence Unit (EIU) notes that the United States is less reliant on external demand than other G7 economies as it is primarily driven by consumer spending(70%), which shelters it from external shocks such as the war in Ukraine which started in February 2022. It also predicted that real GDP growth would remain above the historical trend throughout the year.[53] Overall, despite the continued uncertainty surrounding the national economy due to the worldwide pandemic, the U.S.' strong economy is seen to be

[48] Justin Fox, "Biden's Economy Has the Best Growth Record Since Clinton," *The Washington Post,* September 1, 2022, https://www.washingtonpost.com/business/bidens-economy-has-the-best-growth-record-since-clinton/2022/08/31/45734024-2925-11ed-a90a-fce4015dfc8f_story.html

[49] The White House, "The Small Business Boom Under the Biden-Harris Administration," April 2022, 1, https://www.whitehouse.gov/wp-content/uploads/2022/04/President-Biden-Small-Biz-Boom-full-report-2022.04.28.pdf

[50] The White House, "The Small Business Boom Under the Biden-Harris Administration," April 2022, 1, https://www.whitehouse.gov/wp-content/uploads/2022/04/President-Biden-Small-Biz-Boom-full-report-2022.04.28.pdf

[51] U.S. Department of the Treasury, "FACT SHEET: The Impact of the American Rescue Plan after One Year," March 9, 2022, https://home.treasury.gov/news/press-releases/jy0645

[52] U.S. Department of the Treasury, "FACT SHEET: The Impact of the American Rescue Plan after One Year," March 9, 2022, https://home.treasury.gov/news/press-releases/jy0645

[53] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, April 2022, 2

restored. This is particularly impressive considering the sustained inflation and tightening monetary policy seen through 2022.[54]

Leading American technology and innovation clusters

(I) Silicon Valley, California

Silicon Valley is considered the world's leading technology and innovation cluster. It is the home of some of the largest and most successful companies in cutting-edge technologies, including Apple and Google. The production and manufacturing of high-tech electronic goods has been the centre of Silicon Valley's economy. By 1986, the computer and semiconductor industries made up 50% of Silicon Valley's manufacturing employment.[55] In 2016, Silicon Valley generated a GDP of $722 billion USD out of the total Californian GDP of 2.5 trillion USD.[56] The Silicon Valley is found in the greater San Francisco and San Jose metropolitan areas. It is particularly known for entrepreneurship and innovation, and the globally almost unparalleled access to venture capital and angel investors, who provide initial seed funding for start-up companies to entrepreneurs.[57] San Francisco and San Jose, the metropolitan anchors of Silicon Valley, held 15.4% and 9.9% respectively of global venture capital investment in 2016.[58]

Silicon Valley's success results to a large extent from the contributions and success of post-secondary institutions located in and around the area, and their research activities. The University of California at Berkeley and Stanford University play a vital role in not only training students and a future skilled workforce for Silicon Valley and other innovation clusters but also in attracting and retaining global top-tier talent in

[54] Economist Intelligence Unit, "Country Report, United States of America," New York: The Economist Intelligence Unit, August 2022, 2

[55] David N. Pellow and Lisa Sun-Hee. Park, *The Silicon Valley of Dreams Environmental Injustice, Immigrant Workers, and the High-Tech Global Economy* New York: New York University Press, 2002, 87

[56] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 19, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf; "SQGDP1 Gross Domestic Product (GDP) summary, quarterly by state," Bureau of Economic Analysis, U.S. Department of Commerce, Accessed October 30, 2020, https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1

[57] Richard Florida and City Lab, "The Global Cities Where Tech Venture Capital is Concentrated," *The Atlantic,* January 26, 2016, https://www.theatlantic.com/technology/archive/2016/01/global-startup-cities-venture-capital/429255/

[58] Richard Florida and City Lab, "The Global Cities Where Tech Venture Capital is Concentrated," *The Atlantic,* January 26, 2016, https://www.theatlantic.com/technology/archive/2016/01/global-startup-cities-venture-capital/429255/

R&D and teaching.[59] These universities grew their innovation capabilities through military research funding, especially in universities, and military contracts that supported companies that were instrumental in the initial development of Silicon Valley, these include Hewlett-Packard, Lockheed and Varian.[60] Silicon Valley namesake semiconductor industry was also a key part of its development as nearly 100 semiconductor companies emerged in Silicon Valley between 1950 and 1980, including 5 of the top 10 firms in the industry.[61] A large number of spinoff firms where founders previously worked for another firm in the same industry drove the clustering of the semiconductor industry in the valley.[62] Silicon Valley's innovation is further supported by several industrial research centers including the government funded Lawrence Berkely National Labs and Stanford Accelerator Centre, and private centers looking for their research to benefit from the cluster, such as Hewlett-Packard Labs and the IBM Almaden Research Center.[63]

(II) Cambridge and Boston, MA (Seaport Innovation District)

The cluster in Boston and Cambridge Massachusetts has succeeded as an innovation ecosystem due to the presence of four top-ranked universities: Massachusetts Institute of Technology, Harvard University, Northeastern University and Boston University.[64] Boston ranked 8th in the world Innovation Cities Index.[65] The Boston-Cambridge-Newton metropolitan area produced a GDP of 412 billion USD in 2018.[66] The Boston area has been home to a substantial biotechnology cluster since the early 1990s, with the cluster

[59] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 19-20, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[60] Jerome Engel, "Global Clusters of Innovation: Lessons from Silicon Valley," *California Management Review* 57, no. 2 (February 2015): 39-40
[61] Stephen Klepper, "The Origin and Growth of Industry Clusters: The Making of Silicon Valley and Detroit," Journal of Urban Economics 67, no. 1 (January 2010): 15–32.
[62] Stephen Klepper, "The Origin and Growth of Industry Clusters: The Making of Silicon Valley and Detroit," Journal of Urban Economics 67, no. 1 (January 2010): 15–32.
[63] Jerome Engel, "Global Clusters of Innovation: Lessons from Silicon Valley," *California Management Review* 57, no. 2 (February 2015): 43
[64] Carmelina Bevilacqua, Gabriel Rissola, Burno Monardo, and Claudia Trillo, *Place-based Innovation Ecosystems: Boston-Cambridge Innovation Districts (USA)*, Joint Research Centre (European Commission), April 17, 2019, https://op.europa.eu/en/publication-detail/-/publication/bb80a183-6183-11e9-b6eb-01aa75ed71a1/language-en
[65] 2thinknow, "Innovation Cities Index 2019: Global," *Innovation Cities Program*. 2019, https://www.innovation-cities.com/index-2019-global-city-rankings/18842/
[66] "CAGDP1 Gross Domestic Product (GDP) summaryby country and metropolitan area," Bureau of Economic Analysis, U.S. Department of Commerce, Accessed October 30, 2020, https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1

benefitting from the technology spillover from universities and the presence of rival firms that allow for information exchange and cycling of skilled talent between firms.[67] Universities and their research laboratories were able to attract large amounts of federal funds for defence-related research, and the economy of the Boston region was strongly supported by the development of venture industry company spin off from those laboratories.[68] Researchers found that the Boston and Cambridge area thrives due to its robust urban fabric, which supports a community of innovators.[69] This differs from the spread out and sprawling area of Silicon Valley which lacks dedicated public spaces for gathering and knowledge-sharing. In contrast to Silicon Valley, Boston is characterized by the dominance of large, vertically-integrated producers as well as the proprietary nature of high technology production.[70] The cluster benefits from a quadruple helix model, in which government, universities, enterprise and society are properly embedded in the city fabric and nurture innovation and entrepreneurship.[71] The Seaport Innovation District in Boston, Massachusetts is the result of a planned initiative of a re-imagined urban innovation area with transit access to greater and downtown Boston. It is a highly successful cluster that receives the second largest amount of venture capital investments outside of Silicon Valley.[72] Its development was driven by local government initiatives and grew from the policies of former Boston Mayor Thomas Menino.[73] The district's development was supported by MassChallenge, a start-up accelerator with over 110 companies.[74] It is also

[67] Shiri M. Breznits and William P. Anderson, "Boston Metropolitan Area Biotechnology Cluster," *Canadian Journal of Regional Science* 28, no.2 (2005): 249-264
[68] Harald Bathelt, "Regional Competence and Economic Recovery: Divergent Growth Paths in Boston's High Technology Economy," *Entrepreneurship and regional development* 13, no. 4 (2001): 287–314, 295, 296
[69] Carmelina Bevilacqua, Gabriel Rissola, Burno Monardo, and Claudia Trillo, *Place-based Innovation Ecosystems: Boston-Cambridge Innovation Districts (USA)*, Joint Research Centre (European Commission), April 17, 2019, 8https://op.europa.eu/en/publication-detail/-/publication/bb80a183-6183-11e9-b6eb-01aa75ed71a1/language-en
[70] Harald Bathelt, "Regional Competence and Economic Recovery: Divergent Growth Paths in Boston's High Technology Economy," *Entrepreneurship and regional development* 13, no. 4 (2001): 287–314, 287
[71] Carmelina Bevilacqua, Gabriel Rissola, Burno Monardo, and Claudia Trillo, *Place-based Innovation Ecosystems: Boston-Cambridge Innovation Districts (USA)*, Joint Research Centre (European Commission), April 17, 2019, 8, https://op.europa.eu/en/publication-detail/-/publication/bb80a183-6183-11e9-b6eb-01aa75ed71a1/language-en
[72] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 18, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[73] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 17, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[74] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 18, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf

home to Vertex Pharmaceuticals, a biotech and drug developer, as well as District Hall, a freestanding public innovation building that provides networking events and workshops for entrepreneurs as well as coworking space. The district and wider cluster benefit from top ranked research universities in the Greater Boston Area, which train and attract top talent.[75]

(III) Austin, Texas

A sizeable technology cluster has been developed in Austin, Texas anchored by the research institutes at the University of Texas Austin and Texas A&M University. Austin has rapidly become a leading centre for innovation in high-tech, knowledge economy in recent decades due to its reputation for a high quality of life, low cost of living, culture, and aggressive recruitment campaign by an enlightened and farsighted local growth coalition.[76] This technology cluster helped contribute to Austin's GDP of $135 Billion USD in 2016.[77] Austin is a rare example of a smaller region at a lower level of industrial development which effectively transitioned and evolved into a fast growing, globally competitive technology centre.[78] The metro region was a state university centre of under a population of 400,000 in 1970, whereas by 2018, there were 2.1 million people living in the Austin city region.[79]

The cluster's development was supported by the presence of key tech companies, such as IBM, Texas Instruments, Motorola and Dell Computers, which was started at the University of Texas at Austin.[80] Even though there are different exogenous and endogenous factors that contributed to Austin's economy, its

[75]Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 17, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[76] Eliot Tretter, *Shadows of a Sunbelt City: The Environment, Racism, and the Knowledge Economy in Austin* Athens: The University of Georgia Press, 2016, 2
[77] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 7, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[78] David Gibson and Michael Oden, "The Launch and Evolution of a Technology-based Economy: The Case of Austin Texas," *Growth and change* 50, no. 3 (2019): 947–968, 948
[79] David Gibson and Michael Oden, "The Launch and Evolution of a Technology-based Economy: The Case of Austin Texas," *Growth and change* 50, no. 3 (2019): 947–968, 948
[80] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 8, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf

development trajectory and institutional fabric was dramatically changed in 1983 when the region won the intense national competition for the nation's first for-profit R&D consortium, the Microelectronics and Computing Technology Consortium (MCC).[81] Early funding for development of this cluster came from state funding rather than venture capital or angel investors, and federal funding provided support for research and development at UT Austin.[82] The cluster has also thrived thanks to deep linkages with the Silicon Valley cluster such as migration of Silicon Valley educated workers to Austin.[83] Private high-tech consortium of the Microelectronics and Computer Technology Corporation, as well as the national research consortium of semiconductor manufacturers, SEMATECH, are both headquartered in Austin.[84]

(IV) Other regional clusters

Pittsburgh, Pennsylvania

With a GDP of 138 billion USD in 2019, Pittsburgh contains a tech cluster centered around biotechnology, pharmaceuticals, and IT.[85] The cluster is supported by the strong research capabilities of the Carnegie Mellon University and University of Pittsburgh, as well as its affiliated top-tier research hospital. The existing skilled workforce in Pittsburgh was supplemented by retraining programs for former steel workers in healthcare and computer science.[86] The federal government provides significant funding for Carnegie

[81] David Gibson and Michael Oden, "The Launch and Evolution of a Technology-based Economy: The Case of Austin Texas," *Growth and change* 50, no. 3 (2019): 947–968, 954

[82] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 9, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf

[83] Echeverri-Carroll, Elsie, and Sofia G. Ayala, "Economic growth and linkage with Silicon Valley: the cases of Austin and Boston," *Texas Business Review*, December 2004, 1+. *Gale Academic OneFile* (accessed September 17, 2020). https://link-gale-com.proxy.library.carleton.ca/apps/doc/A126351252/AONE?u=ocul_carleton&sid=AONE&xid=1172c1b8.

[84] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 8, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf

[85] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 10, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf

[86] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 11, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf

Mellon University and University of Pittsburgh, and has also provided funding for a new airport for Pittsburgh which enhanced connectivity to the rest of the U.S., furthering the viability of this cluster.[87]

Research Triangle Park

The research triangle is a biotech, pharmaceutical and information technology cluster located in the cities of Raleigh, Durham and Chapel Hill in the state of North Carolina. The cluster is anchored by nearby Duke University, University of North Carolina - Chapel Hill and North Carolina State. The park was created to boost research and development in the region as well as attract companies to the area. As a "satellite" cluster, high-tech multinational firms have established dedicated R&D centers in this cluster.[88] The cluster has been successful with a reported GDP of $124 Billion USD in 2016.[89]

Akron, Ohio

Akron, Ohio is an urban cluster born out of a former industrial centre for rubber and tire production. After BF Goodrich settled its operation in Akron in 1871, the city became the major centre of the automobile tire industry in the U.S., called the "rubber capital of the world".[90] Akron's growth was promoted by the "Big Four" tire firms of Goodyear, BF Goodrich, General Tire, and Firestone.[91] In 1950, over 130 different companies manufactured rubber in Ohio, employing more than 85 thousand workers and producing more than one-third of the tires and roughly 30% of all other rubber products used in the country.[92] Even though

[87] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 11, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[88] Fallah He, "The Typology of Technology Clusters and Its Evolution — Evidence from the Hi-Tech Industries." Technological forecasting & social change 78, no. 6 (2011): 945–952.
[89] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 13, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[90] Ram Mudambia, Susan M.Mudambia, Debmalya Mukherjeeb, and Vittoria G.Scalera, "Global connectivity and the evolution of industrial clusters: From tires to polymers in Northeast Ohio," *Industrial marketing management* 61, (2017): 20–29, 23
[91] Ram Mudambia, Susan M.Mudambia, Debmalya Mukherjeeb, and Vittoria G.Scalera, "Global connectivity and the evolution of industrial clusters: From tires to polymers in Northeast Ohio," *Industrial marketing management* 61, (2017): 20–29, 23
[92] Ohio History Central, "Rubber industry," n.d., https://ohiohistorycentral.org/w/Rubber_Industry

the rubber industry in Akron began to decline in the 1980s,[93] the city successfully transferred to a polymer cluster through a broader application of its core technological capabilities by shifting the application of chemical competences from tires to polymer science as well as a higher form of innovation within tires by moving from rubber-based innovation to design innovation.[94] The GDP of Akron was $37 Billion USD in 2016.[95]

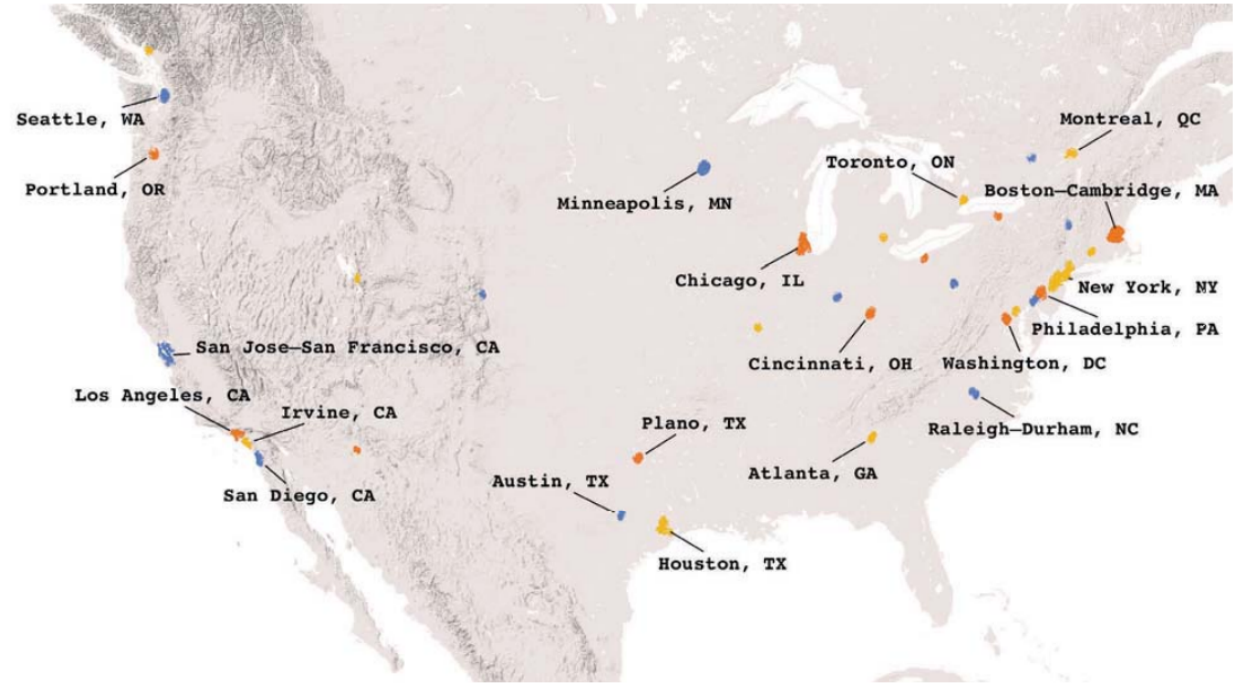

Figure 1 Map of North American Technology Clusters Generated by Geocoded Patent Data[96]

[93] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 13, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[94] Ram Mudambia, Susan M.Mudambia, Debmalya Mukherjeeb, and Vittoria G.Scalera, "Global connectivity and the evolution of industrial clusters: From tires to polymers in Northeast Ohio," *Industrial marketing management* 61, (2017): 20–29, 27
[95] Martin Neil Baily and Nicholas Montalbano, "Clusters and Innovation Districts: Lessons from the United States Experience," Washington, DC: The Brookings Institute, December 2017, 15-16, https://www.brookings.edu/wp-content/uploads/2017/12/es_20171208_bailyclustersandinnovation.pdf
[96] Cornell University, INSEAD, and WIPO, *The Global Innovation Index 2017,* Geneva: World Intellectual Property Organization, 2017, 169, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017.pdf

II. Employment and STEM Workforce

Employment trends in STEM

In 2018, two years prior the COVID-19 pandemic, 9.7 million people in the U.S. held STEM-related occupations.[97] STEM occupations at this point in time were estimated to continue to grow by another 8.8% by 2028, outpacing the growth of non-STEM jobs estimated at 5%.[98] The U.S. Bureau of Labor reported that in 2015, seven out of the ten largest STEM occupations were in computer and information systems, with software developers specifically taking the top position.[99] It was also estimated that the computer occupations will continue to dominate the job growth in the STEM field, with projections showing a 12.5% increase from 2014 to 2024.[100] Evidently, these figures demonstrate a continued demand for STEM talent in the U.S., provided long term growth trends are not too severely disrupted by the COVID-19 pandemic.

In 2019, the largest technology sectors by employees included IT services and custom software services (2.7 million employees), as well as engineering, R&D and testing services (1.9 million), telecommunications and internet services (1.4 million), and technology manufacturing (1.2 million).[101] A 2019 industry group report found that the internet sector was the 4th largest sector of the U.S. economy in terms of employment – with more than 6 million professionals employed, and another 13 million jobs indirectly sustained by this sector.[102] Consumer technology was particularly effective at supporting other jobs; an investigation found

[97] U.S. Bureau of Labor Statistics, "Employment in STEM occupations," September 1, 2020, https://www.bls.gov/emp/tables/stem-employment.htm
[98] U.S. Bureau of Labor Statistics, "Employment in STEM occupations," September 1, 2020, https://www.bls.gov/emp/tables/stem-employment.htm
[99] Fayer, Stella, Alan Lacey, and Audrey Watson, "STEM Occupations: Past, Present, And Future," U.S. Bureau of Labor Statistics, January 2017, 3, https://www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf
[100] Fayer, Stella, Alan Lacey, and Audrey Watson, "STEM Occupations: Past, Present, And Future," U.S. Bureau of Labor Statistics, January 2017, 3, https://www.bls.gov/spotlight/2017/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupations-past-present-and-future.pdf
[101] CompTIA, "Key Findings," *Cyberstates*, Accessed September 10, 2020, https://www.cyberstates.org/index.html#keyfindings
[102] David Shepardson, "Internet sector contributes $2.1 trillion to U.S. economy: industry group," *Reuters*, September 26, 2019, https://www.reuters.com/article/us-usa-internet-economy/internet-sector-contributes-2-1-trillion-to-u-s-economy-industry-group-idUSKBN1WB2QB

that each job created in the consumer technology sector supported 3 non-technology jobs with an employment multiplier of 3.59 in 2019.[103]

Female participation in the U.S. STEM industry varies greatly by sub-sector and there is a great opportunity to make better use of domestic STEM talent by encouraging and supporting women's participation in STEM. Women are already well represented as healthcare practitioners and technicians making up about 75% of this category.[104] Women are close to parity in the fields of life sciences (47%) and mathematics (46%).[105] However, there is very low participation of women in engineering (14%), computer science (25%) and physics (37%).[106] In fact, the proportion of female engineers in the U.S. has remained relatively unchanged since 1990 (12%); and the share of female computer scientists has declined since 1990 when it was recorded at 32%.[107] The U.S. is missing out on potential female innovators and their contributions in fields such as computer science and engineering and supporting domestic female talent can help the U.S. solve shortages of STEM workers. Creating more opportunities for women's participation in STEM must start early, with encouragement and support to study STEM subjects in secondary school and postsecondary education. Support must continue for those who choose to major in STEM. Women drop out of STEM majors at a higher rate than men, with an estimated dropout rate of 36% for female students versus 23% for male students.[108] Those students also lack female teachers as role models leading those fields. According to the U.S. National Science Foundation, women earn roughly half the doctorates in science and engineering, whereas they encompass only 21% of full science professors and 5% of full engineering professors.[109]

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[103] Bronwyn Flores, "Tech Sector Supports 18 Million U.S. Jobs, Represents 12% of GDP, Says CTA," Consumer Technology Association, April 29, 2019, https://www.cta.tech/Resources/Newsroom/Media-Releases/2019/April/Tech-Sector-Supports-18-Million-U-S-Jobs,-Represe

[104] Nikki Graf, Richard Fry and Cary Funk, "7 facts about the STEM workforce," *Pew Research Center,* January 9, 2018, https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/

[105] Nikki Graf, Richard Fry and Cary Funk, "7 facts about the STEM workforce," *Pew Research Center,* January 9, 2018, https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/

[106] Nikki Graf, Richard Fry and Cary Funk, "7 facts about the STEM workforce," *Pew Research Center,* January 9, 2018, https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/

[107] Nikki Graf, Richard Fry and Cary Funk, "7 facts about the STEM workforce," *Pew Research Center,* January 9, 2018, https://www.pewresearch.org/fact-tank/2018/01/09/7-facts-about-the-stem-workforce/

[108] Lisa M. McClean*. Cracking the Code: How to Get Women and Minorities into STEM Disciplines and Why We Must*. New York: Momentum Press, 2017, 14.

[109] Helen Shen, "Inequality Quantified: Mind the Gender Gap," *Nature (London)* 495, no. 7439 (2013): 22–24, 22

Moreover, 20% of engineering graduates are women, while only 11% of practicing engineers are women, which has remained relatively consistent for over two decades.[110] Another dataset also shows that 52% of highly qualified female scientists, engineers, and technologists quit their jobs over time.[111] Those factors indicate a lack of support and preparation given to women who choose to pursue STEM majors. The gender gap persists further down the pipeline to STEM careers, as women with degrees in computer science are 14% less likely than men with the same degree to work in STEM, and 8% less likely for women with engineering degrees.[112] Furthermore, addressing these issues of gender equality in computer science and engineering will also allow the U.S. to remain an attractive destination for global female top talent in addition to maximizing domestic talent.

The STEM labour force shortage has been the subject of intense debate in the U.S. economy. In 2012, the President's Council of Advisors on Science and Technology predicted that there would be a shortage of 1 million STEM professionals in the next decade, and that these positions would need to be filled in order for the U.S. to retain its leadership in science and technology.[113] Without increasing immigration, the number of students receiving undergraduate STEM degrees would have to be increased by 34% to fill this gap.[114] This study found that private sector software development engineers and mobile application engineers were most in demand, with the unemployment rate for software developers at 2.8% in 2012 and 2.2% in the first quarter of 2013.[115] A survey of manufacturers found that there were 600,000 unfilled manufacturing jobs due to a lack of candidates with technical STEM skills at below bachelors' level, such as those in the skilled

[110] Diana Bilimoria and Linley Lord, *Women in STEM Careers: International Perspectives on Increasing Workforce Participation, Advancement and Leadership* Cheltenham, [England] ;: Edward Elgar, 2014, 40
[111] Sylvia Ann Hewlett, Carolyn Buck Luce, and Lisa J Servon, "Stopping the Exodus of Women in Science," *Harvard business review* 86, no. 6 (2008): 22–139, 23
[112] Michelmore Sassler. "A Tale of Two Majors: Explaining the Gender Gap in STEM Employment Among Computer Science and Engineering Degree Holders." *Social sciences (Basel)* 6, no. 3 (July 3, 2017): 69.
[113] President's Council of Advisors on Science and Technology, "Report to the President Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering and Mathematics," February 2012, i https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf
[114] American Immigration Council, "Foreign-born STEM Workers in the United States," June 2017, 1https://www.americanimmigrationcouncil.org/sites/default/files/research/foreign-born_stem_workers_in_the_united_states_final.pdf
[115] Patrick Thibodeau, "Electrical engineers see sharp uptick in Q1 jobless rate," *Computerworld*, April 22, 2013, http://www.computerworld.com/s/article/9238544/Electrical_engineers_see_sharp_uptick_in_Q1_jobless_rate

trades.[116] In the private sector, data scientists and petroleum engineers were also in high demand in certain areas of the US.[117] The National Skills Coalition reports that jobs that require middle skills in science including computer technology, advanced manufacturing, and health care account for roughly 53% of the U.S. labour market whereas only 43% of workers are trained to fill such positions.[118] A 2012 survey of 2007/2008 university graduates showed that, compared to an average fulltime employment rate of 70% for graduates not in further education, 83% of engineering graduates and 77% of computer or information science graduates had fulltime employment.[119] Meanwhile, graduates in life sciences, physical science, math, or agricultural science had a fulltime employment rate of 71%, close to the average, and indicating that demand for these fields is less robust.[120]

In parallel, some researchers have questioned whether the narrative of a general shortage of STEM workers is accurate, and point to findings that as many as 74% of holders of STEM bachelor's degrees worked in occupations outside of STEM.[121] In a 2015 study, Peter Capelli found that there is little empirical evidence for a widespread shortage of STEM skills and workers, and further noted that a series of the claims about skill shortages are largely employer-led, and that these claims may be due to a widespread trend in the reduction of training hours and development for employees, as the responsibility for developing skills has shifted from employers to students and their schools.[122] Other opinions point to a higher unemployment rate for certain STEM professionals as indicative of an oversupply of STEM workers. From the perspective of the academia, an oversupply of STEM workers exists, especially for permanent faculty positions. A 2015

[116] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[117] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[118] Judy Nelson, "Does America need more STEM workers?" *Industry today,* October 22, 2020, https://industrytoday.com/does-america-need-more-stem-workers/
[119] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[120] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[121] Gregory Camilli and Ronil Hira, "Introduction to Special Issue—STEM Workforce: STEM Education and the Post-Scientific Society," *Journal of Science Education and Technology* 28 (1) (02): 1-8.2, 9, 2019; Peter Cappelli, "Skill Gaps, Skill Shortages, and Skill Mismatches: Evidence and Arguments for the United States," *Industrial & labor relations review* 68, no. 2 (2015): 251–290.
[122] Peter Cappelli, "Skill Gaps, Skill Shortages, and Skill Mismatches: Evidence and Arguments for the United States," *Industrial & labor relations review* 68, no. 2 (2015): 251–290

academic literature review found that STEM shortages were present in the private sector and certain government sectors, but that an oversupply of STEM professionals existed in the academic sector.[123] In 2010, less than 15% of new STEM PhDs found a tenure track position within 3 years of graduation.[124] Moreover, researchers found that more STEM PhDs graduated each year than were tenure track positions available in all STEM disciplines.[125]

Depending on the field of study, the supply of STEM graduates exceeds the number hired each year by approximately two to one.[126] A third of computer science graduates and nearly half of engineering graduates do not participate in a job directly related to their degree.[127] A large share of those graduates with the most IT-relevant education report that they were unable to obtain an IT job, or they found IT jobs to be paying lower wages or offering less attractive working conditions and career prospects than other non-STEM jobs.[128] In the public sector, researchers found no evidence of a widespread shortage of STEM professionals. Although there were positions that were difficult to fill because there was a lack of qualified U.S. citizens, for example, those with education in materials science, nuclear engineering or thermohydraulic engineering.[129] As there are restrictions on hiring non-U.S. citizens for sensitive government positions, this makes filling these positions difficult. In order to address these shortages, the U.S. will have to improve domestic STEM training, improve STEM education for underserved students, and support women's participation to make sure domestic talent is fully utilized in filling these public sector roles.

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[123] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[124] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[125] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm
[126] Hal Salzman, Daniel Kuehn, and B. Lindsay Lowwell, "Guestworkers in the high-skill U.S. labor market: An analysis of supply, employment, and wage trends," *Economic Policy Instutute*, Briefing Paper #359, April 2013, 7 https://files.epi.org/2013/bp359-guestworkers-high-skill-labor-market-analysis.pdf
[127] Hal Salzman, Daniel Kuehn, and B. Lindsay Lowwell, "Guestworkers in the high-skill U.S. labor market: An analysis of supply, employment, and wage trends," *Economic Policy Instutute*, Briefing Paper #359, April 2013, 7 https://files.epi.org/2013/bp359-guestworkers-high-skill-labor-market-analysis.pdf
[128] Hal Salzman, Daniel Kuehn, and B. Lindsay Lowwell, "Guestworkers in the high-skill U.S. labor market: An analysis of supply, employment, and wage trends," *Economic Policy Instutute*, Briefing Paper #359, April 2013, 8 https://files.epi.org/2013/bp359-guestworkers-high-skill-labor-market-analysis.pdf
[129] Yi Xue and Richard C. Larson, "STEM crisis or STEM surplus? Yes and yes," *U.S. Bureau of Labor Statistics*, May 2015, https://www.bls.gov/opub/mlr/2015/article/stem-crisis-or-stem-surplus-yes-and-yes.htm

STEM Skills and Education

The U.S. ranked 35th out of 174 economies in the Human Capital Index 2020 produced by the World Bank.[130] Even though it is slightly lower than average for high income countries, the Human Capital Index (HCI) value for the U.S. increased from 0.69 to 0.70 between 2010 and 2020.[131] In the meantime, based on the World Economic Forum version of the HCI, the country ranked 4th out of 130 countries as of 2017, following only Norway, Finland, and Switzerland.[132] According to this report, the U.S. spent 5.4% of GDP on education and had a tertiary education attainment rate of 31.5% among 25-54-year-olds.[133] Additionally, more than 40% of 25-54-year-olds were classified as working in high-skilled occupations.[134] The U.S. ranked 22nd in capacity, 43rd in deployment, 4th in development, and 13th in know-how in the World Economic Forum HCI.[135]

Furthermore, the U.S. ranked 3rd worldwide by number of STEM graduates with over 568,000 graduates in 2016, behind India with 2.6 million, and China with 4.7 million.[136] The country had a comparable ratio of STEM graduates to population (1:573) to India (1:516), though it falls far behind China (1:293).[137] Overall, 51.6% of international students in the U.S. were studying in STEM fields in 2018/19.[138] The top sources of international students in undergraduate, graduate, non-degree, and optional practical training programs in

[130] World Bank, "The Human Capital Index 2020 Update: Human Capital in the Time of COVID-19," *World Bank,* Washington, DC, 2020, 41, https://openknowledge.worldbank.org/bitstream/handle/10986/34432/9781464815522.pdf?sequence=4&isAllowed=y
[131] World Bank, "United States: Human Capital Index 2020," *World Bank,* Washington, DC, 2020, https://databank.worldbank.org/data/download/hci/HCI_1pager_USA.pdf?cid=GGH_e_hcpexternal_en_ext
[132] "The Global Human Capital Report," *World Economic Forum,* 2017, 182, http://www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf
[133] "The Global Human Capital Report," *World Economic Forum,* 2017, 182, http://www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf
[134] "The Global Human Capital Report," *World Economic Forum,* 2017, 182, http://www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf
[135] "The Global Human Capital Report," *World Economic Forum,* 2017, 182, http://www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf
[136] World Economic Forum, "Infographics and Shareables," *Human Capital Report 2016,* http://reports.weforum.org/human-capital-report-2016/infographics-and-shareables/
[137] Arthur Hernan, "America's High-Tech STEM Crisis," *Forbes*, September 10, 2018, https://www.forbes.com/sites/arthurherman/2018/09/10/americas-high-tech-stem-crisis/#77cd3d6df0a2
[138] Institute of International Education, "Number of International Students in The United States Hits an All-Time High," *iie*, November 18, 2019, https://www.iie.org/en/Why-IIE/Announcements/2019/11/Number-of-International-Students-in-the-United-States-Hits-All-Time-High

the United States were China (369,548), India (202,014), South Korea (52,250), Saudi Arabia (37,080), and Canada (26,111).[139]

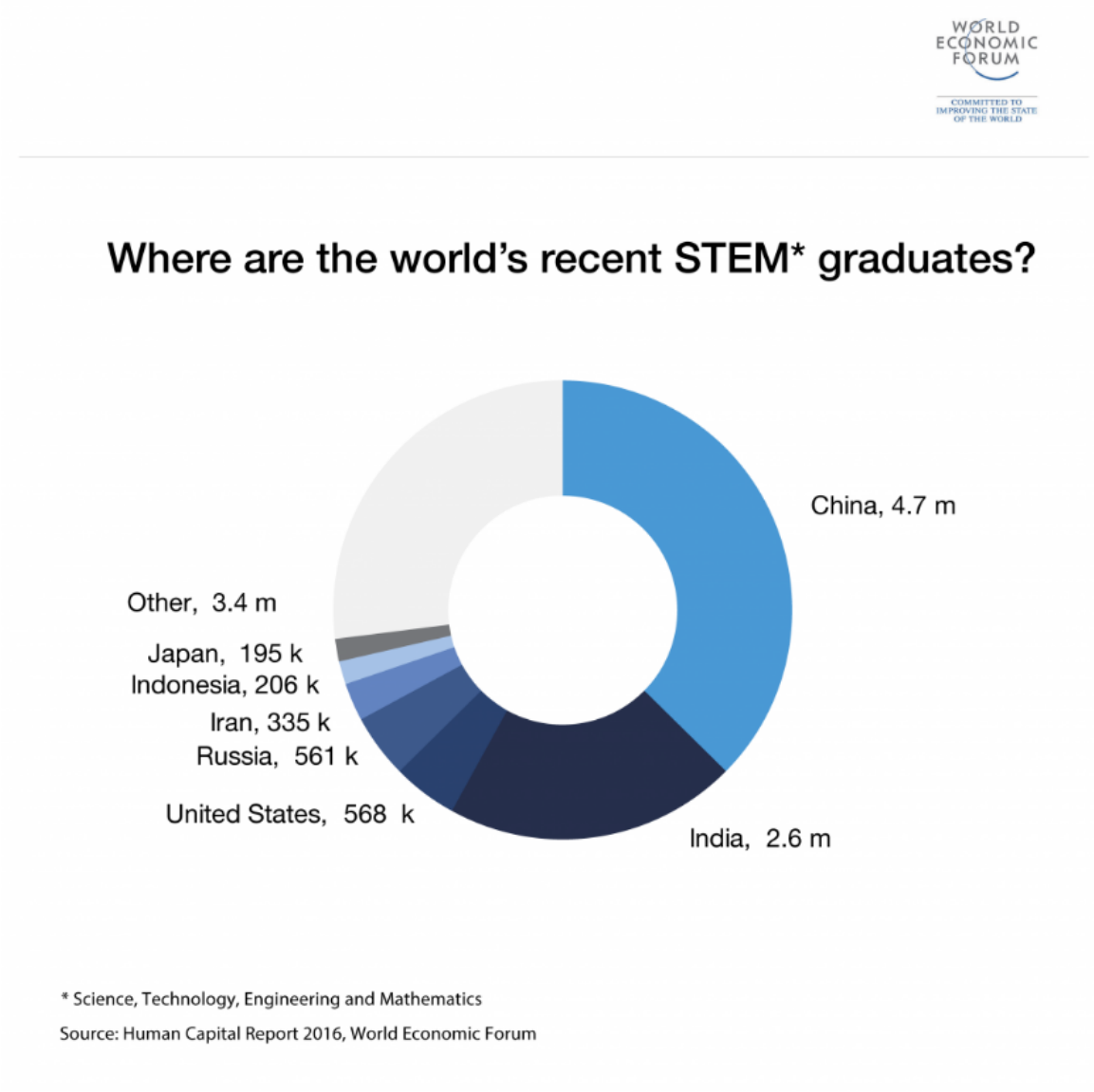

Figure 2 Number of STEM Graduates by Country (World Economic Forum)

[139] Institute of International Education, "Number of International Students in The United States Hits an All-Time High," *iie*, November 18, 2019, https://www.iie.org/en/Why-IIE/Announcements/2019/11/Number-of-International-Students-in-the-United-States-Hits-All-Time-High

It is also notable that there has been a growing concern that American primary and secondary schools are not providing children with the necessary education and skills to fill and excel in STEM occupations. In the OECD's[140] Programme for International Student Assessment, which compares reading ability, math skills, and science skills among 15-year-olds, out of 78 countries, the U.S. ranked only 13th in reading, 18th in science and 37th in math in 2018.[141] The college testing organization ACT found that just 21% of high school students met math and science benchmarks for STEM, as measured by a 50% chance of earning a B grade or 75% chance of earning a C in a first-year college STEM course.[142]

Moreover, the situation is more severe when considering underserved students. Students were considered underserved based on three categories: being a visible minority, a 1st generation college student, or a low-income student.[143] While 32% of students who do not fit those categories met STEM benchmarks, only 11% of those who fit one, 5% of those who fit two, and 2% of those who fit all three met the benchmarks.[144] The U.S. clearly needs to develop more equitable education in order to maximize home-grown talent and innovation. The ACT recommends that states adopt more rigorous STEM education, however, some academics have questioned adopting such a narrow focus on STEM education and have pointed out that emerging occupations will likely require a mixture of STEM and non-STEM skills, and therefore STEM education must be balanced with effective education in humanities and social sciences.[145]

Despite the fact that 48% of students tested by the ACT expressed an interest in STEM, America faces a looming problem of a lack of STEM educators as just 0.43% of students interested in math and 0.17% of

[140] Organization for Economic Development and Co-Operation.
[141] Andreas Schleicher, *PISA 2018 Insights and Interpretation,* OECD, 2019, 6-8, http://www.oecd.org/pisa/PISA%202018%20Insights%20and%20Interpretations%20FINAL%20PDF.pdf
[142] ACT, "STEM Education in the U.S.: Where We Are and What We Can Do 2017," *ACT,* 2017, 5, https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf
[143] ACT, "STEM Education in the U.S.: Where We Are and What We Can Do 2017," *ACT,* 2017, 11, https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf
[144] ACT, "STEM Education in the U.S.: Where We Are and What We Can Do 2017," *ACT,* 2017, 11, https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf
[145] Gregory Camilli and Ronil Hira, "Introduction to Special Issue—STEM Workforce: STEM Education and the Post-Scientific Society," *Journal of Science Education and Technology* 28 (1) (02, 2019): 1-8.2, 9, Christopher Hill. "STEM is Not enough: Education for Success in the Post-Scientific Society," *Journal of Science Education and Technology* 28 (1) (02, 2019): 69-73.

those interested in science expressed an interest in a career in math or science education.[146] The ACT recommends incentivizing people to enter STEM education by raising salaries and offering student loan forgiveness for STEM teachers.[147] The U.S. could also implement strategies to try to attract STEM educators from abroad to fill this growing shortage.

Foreign-born STEM Workforce

In 2019, the U.S. labour force counted 28.4 million foreign-born workers, accounting for 17.4% of the total labour force.[148] Foreign-born workers play a vital role in the U.S. economy. They were overrepresented in the service, natural resources, construction, maintenance, production, transportation and material moving industries, while they were less likely to be working in management, professional sales and office occupations.[149] On average, they earned less than US-born workers, making $800 USD in weekly compensation in comparison to an average of $941 USD for US-born workers.[150] In terms of high-skilled workers, foreign workers with a bachelor's degree or higher earned more on average than US-born workers with similar education levels.[151] In the fiscal year 2013, 1.42 million were temporary foreign workers on non-immigrant visas, comprising less than 1% of the total U.S. workforce.[152] This includes 461,000 foreign professionals on the H-1B skilled visa for specialty occupations, 311,000 on the L-1 visa for intracompany transfers, almost 30,000 on the O-1 visa for persons with extraordinary ability in arts in sciences, and

[146] ACT, "STEM Education in the U.S.: Where We Are and What We Can Do 2017," *ACT,* 2017, 9 https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf
[147] ACT, "STEM Education in the U.S.: Where We Are and What We Can Do 2017," *ACT,* 2017, 20-23, https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf
[148] U.S. Bureau of Labor Statistics, "Foreign-Born Workers: Labor Force Characteristics – 2019, " May 15, 2020, 1 https://www.bls.gov/news.release/pdf/forbrn.pdf
[149] U.S. Bureau of Labor Statistics, "Foreign-Born Workers: Labor Force Characteristics – 2019, "May 15, 2020, 1 https://www.bls.gov/news.release/pdf/forbrn.pdf
[150] U.S. Bureau of Labor Statistics, "Foreign-Born Workers: Labor Force Characteristics – 2019, "May 15, 2020, 1 https://www.bls.gov/news.release/pdf/forbrn.pdf
[151] U.S. Bureau of Labor Statistics, "Foreign-Born Workers: Labor Force Characteristics – 2019, "May 15, 2020, 4 https://www.bls.gov/news.release/pdf/forbrn.pdf
[152] Daniel Costa and Jennifer Rosenbaum,"Temporary foreign workers by the numbers," *Economic Policy Institute*, March 7, 2017, https://www.epi.org/publication/temporary-foreign-workers-by-the-numbers-new-estimates-by-visa-classification/

139,000 on the F-1 visa for foreign students who are employed fulltime through the Optional Practical Training program.[153]

Since the mid 2000s, immigrants have accounted for the majority of U.S. workers in STEM with doctoral degrees.[154] In 2010, foreign-born individuals represented over 27% of college-educated STEM workers in the metropolitan statistical areas.[155] This percentage has more than doubled since 1980.[156] While college-educated STEM workers have increased from 1.76% of total employment in 1980 to 3.2% in 2010, the share of college-educated foreign STEM workers has grown from 0.19% to 0.87%.[157] Specifically, of the 0.78 point increase between 1990 and 2010 in college-educated STEM as a percentage of employment, 0.53 points, which accounts for two-thirds of the total, were due to foreigners.[158]

The American Immigration Council also reports that the share of foreign-born workers has increased since 1990 in a variety of fields such as computer and math, engineering, social sciences, and health-related occupations, of which the largest increase was in computer and math fields with an increase from 12% foreign-born in 1990 to 26% in 2015.[159] Further research shows that the share of foreign-born workers in the U.S. STEM workforce in 2014 was 22%, of which 56% worked in computer occupations, 27% in engineering, and 13.6% in life sciences and physical sciences.[160] The foreign-born STEM workforce is younger on average, and more likely to hold an advanced degree (greater than bachelor's), with 49.3% of

[153] Daniel Costa and Jennifer Rosenbaum,"Temporary foreign workers by the numbers," *Economic Policy Institute*, March 7, 2017, https://www.epi.org/publication/temporary-foreign-workers-by-the-numbers-new-estimates-by-visa-classification/
[154] Matthew J Slaughter and Gordon H Hanson, *High-Skilled Immigration and the Rise of STEM Occupations in U.S. Employment*, National Bureau of Economic Research, 2016, 15, https://www.nber.org/system/files/working_papers/w22623/w22623.pdf
[155] Giovanni Peri, Kevin Shih, and Chad Sparber, "STEM Workers, H-1B Visas, and Productivity in U.S. Cities," *Journal of labor economics* 33, no. S1 (2015): 225–255, 232
[156] Giovanni Peri, Kevin Shih, and Chad Sparber, "STEM Workers, H-1B Visas, and Productivity in U.S. Cities," *Journal of labor economics* 33, no. S1 (2015): 225–255, 232
[157] Giovanni Peri, Kevin Shih, and Chad Sparber, "STEM Workers, H-1B Visas, and Productivity in U.S. Cities," *Journal of labor economics* 33, no. S1 (2015): 225–255, 232
[158] Giovanni Peri, Kevin Shih, and Chad Sparber, "STEM Workers, H-1B Visas, and Productivity in U.S. Cities," *Journal of labor economics* 33, no. S1 (2015): 225–255, 232
[159] American Immigration Council, "Foreign-born STEM Workers in the United States," June 2017, 4, https://www.americanimmigrationcouncil.org/sites/default/files/research/foreign-born_stem_workers_in_the_united_states_final.pdf
[160] Donovan Augustus Anderson, "Foreign-Born STEM Workforce in the United States," *United States Census Bureau*, April 2, 2016, https://www.census.gov/content/dam/Census/library/working-papers/2016/demo/SEHSD-WP2016-14.pdf

foreign-born workers holding an advanced degree in comparison to 22.3% of native-born workers.[161] More than half of all STEM professionals holding a PhD and more than 40% of those holding a Master's degree were reported to be foreign-born in 2014.[162] This seems to be a common pathway for many foreign-born professionals: to earn a STEM-related degree in the U.S. and then joining the U.S. STEM workforce rather than returning to their home countries.[163] At the same time, the continued immigration of global STEM talent and future prospects (international students enrolled in STEM disciplines) provides a vital means for the U.S. to address and counter its lack of U.S. born STEM talent.[164] The high education attainment rate also demonstrates that foreign-born workers play a large role in filling specialized and high-skilled occupations. Foreign workers in STEM also reach earnings parity with native workers much faster than in other fields. In non-STEM fields, foreign workers require 20 years or more to reach earning parity, in STEM fields, they achieve earning parity in under a decade.[165] According to the American Immigration Council, foreign-born talent also makes an outsized contribution to the creation of new firms, 25% of all high-tech companies founded between 1995 and 2005 had at least one immigrant/foreign-born founder.[166]

As raised previously, lower female participation remains an issue in the country's STEM field, this is also the case for immigrants. Female high skilled global talent may face certain structural barriers to finding employment in the U.S. In 2010 the OECD found that 37% of high-skilled female immigrants in the United States were in employed in occupations that do not match their level of education.[167]

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[161] Donovan Augustus Anderson, "Foreign-Born STEM Workforce in the United States," *United States Census Bureau*, April 2, 2016, https://www.census.gov/content/dam/Census/library/working-papers/2016/demo/SEHSD-WP2016-14.pdf
[162] Donovan Augustus Anderson, "Foreign-Born STEM Workforce in the United States," *United States Census Bureau*, April 2, 2016, https://www.census.gov/content/dam/Census/library/working-papers/2016/demo/SEHSD-WP2016-14.pdf
[163] Gordon H. Hanson and Matthew J. Slaughter, "High-Skilled Immigration and the Rise of STEM Occupations in U.S. Employment, "The National Bureau of Economic Research, October 2016, 14, https://www.nber.org/papers/w22623.pdf
[164] Gordon H. Hanson and Matthew J. Slaughter, "High-Skilled Immigration and the Rise of STEM Occupations in U.S. Employment, "The National Bureau of Economic Research, October 2016, 14, https://www.nber.org/papers/w22623.pdf
[165] Gordon H. Hanson and Matthew J. Slaughter, "High-Skilled Immigration and the Rise of STEM Occupations in U.S. Employment, " The National Bureau of Economic Research, October 2016, 2-3:29, https://www.nber.org/papers/w22623.pdf
[166] American Immigration Council, "Foreign-Born STEM Workers in the United States," June 2017, 1, https://www.americanimmigrationcouncil.org/sites/default/files/research/foreign-born_stem_workers_in_the_united_states_final.pdf
[167] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4), 88

The COVID-19 pandemic highlighted the importance of healthcare innovation worldwide. Several types of occupations within the STEM industries, such as physicians and computer engineers, are required to improve the U.S.' competitive advantage in healthcare; however, these industries have consistently had a 5% or higher rate of job openings over the last ten years.[168] In 2021, 73% of prospective international students surveyed would stay in the U.S. permanently if a visa was easily available to them upon graduation with 38% of prospective students claiming they would work in the U.S. for four years or longer after graduation.[169] Currently, the OPT program does not allow international students to work in the U.S. for this long.[170] Thus, international students in STEM in the U.S. could fill the gap in the STEM workforce to improve U.S. competitiveness, but the restrictions on U.S. immigration pose significant barriers to these students. Some improvements towards open immigration for these students include increasing H-1B visas and replacing the lottery-based system for H-1B visas with "wage ranking of candidates," which would entail using a candidate's prospective salary as a proxy for that worker's potential value to the U.S. economy.[171]

[168] Philip Connor, Andrew Moriarity, Kate Hansen, "Retaining U.S. International Student Graduates to Win the Global Talent Race," FWD.us, February 3, 2022, https://www.fwd.us/wp-content/uploads/2022/02/FWD-International-Student-Report-V6-012822.pdf.
[169] Philip Connor, Andrew Moriarity, Kate Hansen, "Retaining U.S. International Student Graduates to Win the Global Talent Race," FWD.us, February 3, 2022, https://www.fwd.us/wp-content/uploads/2022/02/FWD-International-Student-Report-V6-012822.pdf.
[170] Philip Connor, Andrew Moriarity, Kate Hansen, "Retaining U.S. International Student Graduates to Win the Global Talent Race," FWD.us, February 3, 2022, https://www.fwd.us/wp-content/uploads/2022/02/FWD-International-Student-Report-V6-012822.pdf .
[171] William Kerr, "Global Talent and U.S. Immigration Policy," Working Paper 20-107, Stanford University, 2017, 13, https://www.hbs.edu/ris/Publication%20Files/20-107_0967f1ab-1d23-4d54-b5a1-c884234d9b31.pdf.

III. Global Talent Recruitment and Retention

As the world's largest economy, the U.S. has been and continues to be one of the most sought-out destinations for immigrants. While the migration rate of the U.S. is the 2nd lowest among G7 countries after Japan, it still has the largest migrant population in the world.[172] Over 40 million people living in the U.S. were born in another country, accounting for 1/5th of the world's migrants.[173] From 2010 to 2015, the U.S. welcomed the largest number of migrants, 4,952,000, close to 1 million per a year.[174]

The number of immigrants living in the U.S. significantly increased when the government abolished a national quota system in the early 20th century. Under the national-origins quota system, which was established in 1921 and revised in 1924, immigration was limited by designating each nationality a quota based on its representation in past national census records.[175] The U.S. issued visas within the annual limit measured in the 1910 census for the 1921 bill and in the 1890 census for the 1924 bill, reinforcing previously dominant immigrant patterns and blocking the immigrant populations that had increasingly dominated the immigrant flow in the early twentieth century, especially Southern and Eastern Europeans who had only begun to immigrate in large numbers after 1890.[176] Immigration to the U.S. significantly decreased over the next 20 years, with net immigration during the Great Depression dropping to below 0.[177] Under the Immigration and Nationality Act (INA) of 1952 that reaffirmed the quota system, 81.6% of the total numerical quota was assigned to Western European countries, predominantly the U.K. (43.2%), Germany (16.7%), and Ireland (11.5%), with 16% allocated to countries in Southern and Eastern Europe.[178]

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[172] UN, "Data Query," *Population Division: World Population Prospects 2019*, 2019, https://population.un.org/wpp/DataQuery/
[173] Abby Budiman, "Key findings about U.S. immigrants," *Pew Research Center*, August 20, 2020, https://www.pewresearch.org/fact-tank/2020/08/20/key-findings-about-u-s-immigrants/
[174] UN, "Data Query," *Population Division: World Population Prospects 2019*, 2019, https://population.un.org/wpp/DataQuery/
[175] Center for Immigration Studies, "Historical Overview of Immigration Policy," n.d., https://cis.org/Historical-Overview-Immigration-Policy
[176] Louis DeSipio and Rodolfo O de la Garza. U.S. *Immigration in the Twenty-First Century: Making Americans, Remaking America*. 1st ed. Routledge, 2015, 75
[177] Center for Immigration Studies, "Historical Overview of Immigration Policy," Accessed October 17, 2020, https://cis.org/Historical-Overview-Immigration-Policy
[178] Timothy J. Hatton, "United States Immigration Policy: The 1965 Act and Its Consequences: U.S. Immigration Policy," *The Scandinavian journal of economics* 117, no. 2 (2015): 347-368, 348-349

In 1965, Congress passed an amendment to the previous Act and replaced the national origins quota system with a seven category preference system.[179] This new system was to give preference to immigrants of high skill, particularly those belonging to professions that were in short supply in the U.S., regardless of their nationality.[180] As a result, the number of immigrants, especially Asian and Latin American migrants arriving in the U.S. increased and the total number arriving each year more than tripled from roughly 320,000 in the 1960s to over 1 million per year by the 21st century.[181] The 1990 Act expanded the 1965 Act and retained family reunification as the major entry path while more than doubling employment-based immigration.[182] Occupation-based visas, which emphasized education and work skills available per year, increased from 54,000 to 140,000, and the H-1B program was created to target temporary workers in specialty occupations, many of which were STEM-related.[183]

The law also offered admission of immigrants from "underrepresented" countries by creating a lottery system.[184] Under this Diversity Visa Program, each year 55,000 visas are assigned randomly to nationals from countries that have sent fewer than 50,000 immigrants to the U.S. in the previous five years. [185] In this way, low-admission regions including Europe and Africa receive a higher allocation than high-admission regions such as Asia and Latin America.[186]

Immigration policies in the U.S. have been built upon principles including reunification of families, approving immigrants with skills who are valuable to the national economy, protecting refugees, and

[179] Timothy J. Hatton, "United States Immigration Policy: The 1965 Act and Its Consequences: U.S. Immigration Policy," *The Scandinavian journal of economics* 117, no. 2 (2015): 347-368, 348-349
[180] Sheldon Friedman, "The Effect of the U.S. Immigration Act of 1965 on the Flow of Skilled Migrants from Less Developed Countries." *World development* 1, no. 8 (1973): 39–44, 39
[181] Center for Immigration Studies, "Historical Overview of Immigration Policy," n.d., https://cis.org/Historical-Overview-Immigration-Policy
[182] Center for Immigration Studies, "Historical Overview of Immigration Policy," n.d., https://cis.org/Historical-Overview-Immigration-Policy
[183] Tyler Ransom and John V Winters, "Do Foreigners Crowd Natives Out of STEM Degrees and Occupations? Evidence from the U.S. Immigration Act of 1990," *Industrial & labor relations review* 74, no. 2 (2021): 321–351, 322
[184] Center for Immigration Studies, "Historical Overview of Immigration Policy," Accessed October 17, 2020, https://cis.org/Historical-Overview-Immigration-Policy
[185] American Immigration Council, "How the United States Immigration System Works," *Fact Sheet*, September 14, 2021, https://www.americanimmigrationcouncil.org/research/how-united-states-immigration-system-works
[186] Andowah A. Newton, "Injecting Diversity into U.S. Immigration Policy: The Diversity Visa Program and the Missing Discourse on Its Impact on African Immigration to the United States," *Cornell international law journal* 38, no. 3 (2005): 1049-1082, 1054-1055

promoting diversity.[187] The current INA allows the U.S. to grant up to 675,000 permanent immigrant visas a year across different visa categories, but it does not set a limit on admission for U.S. citizens' spouses, parents, or children under the age of 21.[188] Furthermore, no group of permanent immigrants from a single country can exceed 7% of the total number of people landing in the U.S. in a single fiscal year in order to prevent any immigrant group from dominating immigration patterns to the U.S.[189]

Immigration has been a major contributor to the growth in population of the U.S. The country experienced a population growth rate of 0.62% between 2015 and 2020 and the growth rate was predicted to be 0.54% in the 5 years following. According to UN data, the net migration rate of the U.S. was marked at 3.2 per 1000 from 2010 to 2015 and estimated to be 2.9 from 2015 to 2020.[190] Over the last several decades, immigrants from Asia and Latin America have made up more than 75% of legal immigrants and an even larger share of undocumented migrants.[191] Mexico is the top origin country of the U.S. immigrant population as of 2018; approximately 11.2 million people are from Mexico which accounts for 25% of all U.S. immigrants, followed by China (6%), India (6%), the Philippines (4%), and El Salvador (3%).[192]

Presently, an increasing number of Asian immigrants have landed in the U.S. since 2009, superseding Hispanic immigrants; in 2018, the top source country was China with 149,000 people, followed by India with 129,000, Mexico with 120,000, and the Philippines with 46,000. If these trends continue, it is estimated that Asians will become the largest immigrant group in the U.S., surpassing Hispanics by 2055.[193]

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[187] American Immigration Council, "How the United States Immigration System Works," *Fact Sheet*, September 14, 2021, https://www.americanimmigrationcouncil.org/research/how-united-states-immigration-system-works
[188] American Immigration Council, "How the United States Immigration System Works," *Fact Sheet*, September 14, 2021, https://www.americanimmigrationcouncil.org/research/how-united-states-immigration-system-works
[189] American Immigration Council, "How the United States Immigration System Works," *Fact Sheet*, September 14, 2021, https://www.americanimmigrationcouncil.org/research/how-united-states-immigration-system-works
[190] United Nations Department of Economic and Social Affairs, "Net migration rate (per 1,000 population)," *World Population Prospects 2019,* 2019, https://population.un.org/wpp/Download/Standard/Migration/
[191] Louis DeSipio and Rodolfo O de la Garza. U.S. *Immigration in the Twenty-First Century: Making Americans, Remaking America*. 1st ed. Routledge, 2015, 89
[192] Abby Budiman, "Key findings about U.S. immigrants," *Pew Research Center*, August 20, 2020, https://www.pewresearch.org/fact-tank/2020/08/20/key-findings-about-u-s-immigrants/
[193] Abby Budiman, "Key findings about U.S. immigrants," *Pew Research Center*, August 20, 2020, https://www.pewresearch.org/fact-tank/2020/08/20/key-findings-about-u-s-immigrants/

In 2017, approximately 29 million immigrants, 17% of the total civilian labour force, were working or looking for work in the U.S., with 21.2 million lawful workers and 7.6 million undocumented workers.[194] The U.S. has historically hosted nearly half of all high skilled immigrants to the OECD countries, accounting for 1/3 of high skilled foreign workers worldwide.[195] As of 2013, Silicon Valley and New York City host about 1/8th of all STEM employment in the U.S. nationwide, and 70% of software engineers and 56% of STEM workers in Silicon Valley are foreign born.[196]

Despite the crucial role foreign-born workers play in STEM sectors, immigration is a deeply contested and polarizing political issue in the U.S. In a public poll in 1944, 63% of respondents said immigrants were a burden to the country by taking jobs, housing, and healthcare resources.[197] A 2019 survey (n=1,505) found that 34% of Americans felt that immigrants were a burden to society, and 59% felt that immigrants made the country stronger due to their skills.[198] Even though these numbers have changed greatly in recent decades in favour of immigration, Republicans and Democrats have been increasingly divided in their views of immigrants.[199][200] Approximately 38% of politically right-leaning respondents believed immigrants made the country stronger in comparison with 83% of left-leaning respondents.[201] Another survey discovered that Democrats' views have largely accounted for the shift. Starting around 2008, Democratic support for more immigration rose from approximately 20% to 47% by 2021.[202] Meanwhile, 70% of Democrats think that

[194] Abby Budiman, "Key findings about U.S. immigrants," *Pew Research Cente*r, August 20, 2020, https://www.pewresearch.org/fact-tank/2020/08/20/key-findings-about-u-s-immigrants/
[195] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4), 86
[196] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4), 88
[197] Bradley Jones, "Majority of Americans continue to say immigrants strengthen the U.S.," *Pew Research Center*, January 31, 2019, https://www.pewresearch.org/fact-tank/2019/01/31/majority-of-americans-continue-to-say-immigrants-strengthen-the-u-s/
[198] Bradley Jones, "Majority of Americans continue to say immigrants strengthen the U.S.," *Pew Research Center*, January 31, 2019, https://www.pewresearch.org/fact-tank/2019/01/31/majority-of-americans-continue-to-say-immigrants-strengthen-the-u-s/
[199] Bradley Jones, "Majority of Americans continue to say immigrants strengthen the U.S.," *Pew Research Center*, January 31, 2019, https://www.pewresearch.org/fact-tank/2019/01/31/majority-of-americans-continue-to-say-immigrants-strengthen-the-u-s/
[200] Emily Ekins and David Kemp, "Poll: 72% of Americans Say Immigrants Come to the United States for Jobs and to Improve Their Lives," *CATO Institute,* April 27, 2021, https://www.cato.org/blog/poll-72-americans-say-immigrants-come-us-jobs-improve-their-lives-53-say-ability-immigrate
[201] Bradley Jones, "Majority of Americans continue to say immigrants strengthen the U.S.," *Pew Research Center*, January 31, 2019, https://www.pewresearch.org/fact-tank/2019/01/31/majority-of-americans-continue-to-say-immigrants-strengthen-the-u-s/
[202] Emily Ekins and David Kemp, "Poll: 72% of Americans Say Immigrants Come to the United States for Jobs and to Improve Their Lives," *CATO Institute,* April 27, 2021, https://www.cato.org/blog/poll-72-americans-say-immigrants-come-us-jobs-improve-their-lives-53-say-ability-immigrate

racist beliefs drive the desire for less immigration, in contrast 57% of all Americans, 60% of independents, and 88% of Republicans believe that a sincere concern in managing the country's border is the reason.[203] Changing public opinion as well as whether congress is democrat or republican-held has been and will continue to be key forces shaping America's immigration policy.

The U.S. is a highly attractive destination for global talent due to various factors such as the size of economy and labour market, quality of opportunities, competitive salaries, and comparatively lower taxes, as well as good amenities, a good skills environment, and high quality of life.[204] However, its attractiveness as a destination is marred by increasingly restrictive visa policies, which lower the likelihood of attaining a visa.[205] In 2019, the OECD ranked the U.S. 7th out of 35 countries in attractiveness for highly-skilled foreign workers with a Masters or Doctorate degree, 13th for entrepreneurs and 5th for international students.[206] The U.S. attractiveness for both high skilled workers and entrepreneurs is hindered by high rates of refusal and a restrictive system of strict quotas for visas.[207] The U.S. has comparatively high requirements for foreign entrepreneurs seeking to obtain the EB-5 visa, entrepreneurs must have at least 1 million USD capital invested in their business and must show that they will create at least 10 jobs in the U.S.[208] These strict requirements lead to many entrepreneurs settling in countries such as Canada, New Zealand and Switzerland where there are more liberal policies for immigrant entrepreneurs.

The U.S. is an outlier among immigration nations in that it operates an employer-demand driven immigration visa system primarily through the H-1B and L1 visa for highly skilled workers.[209] This stands in contrast to supply-driven migration systems seen in countries such as Australia and Canada which uses a points-based system to screen and approve global talent to create a supply of highly skilled workers. The

[203] [203] Emily Ekins and David Kemp, "Poll: 72% of Americans Say Immigrants Come to the United States for Jobs and to Improve Their Lives," *CATO Institute,* April 27, 2021, https://www.cato.org/blog/poll-72-americans-say-immigrants-come-us-jobs-improve-their-lives-53-say-ability-immigrate
[204] OECD, "Migration Policy Debates." May 2019, No.19, 3, https://www.oecd.org/els/mig/migration-policy-debates-19.pdf
[205] OECD, "Migration Policy Debates." May 2019, No.19, 3, https://www.oecd.org/els/mig/migration-policy-debates-19.pdf
[206] OECD, "Migration Policy Debates." May 2019, No.19, 5-6, https://www.oecd.org/els/mig/migration-policy-debates-19.pdf
[207] OECD, "Migration Policy Debates." May 2019, No.19, 4-5, https://www.oecd.org/els/mig/migration-policy-debates-19.pdf
[208] OECD, "Migration Policy Debates." May 2019, No.19, 5, https://www.oecd.org/els/mig/migration-policy-debates-19.pdf
[209] Yoland Pottie-sherman, "Talent for Citizenship and the American Dream: The USA as Outlier in the Global Race for Talent," *Journal of International Migration and Integration* 14, no. 3 (08, 2013): 557-575, 558

demand-based system helps avoid underemployment for highly skilled immigrants, however both the H-1B and the L1 visa are subject to quotas and as a result employer demand has outpaced the supply of visas in recent years. This has the potential to constrain economic growth; if companies cannot hire the global talent they need, they will grow less and create less demand for domestic labour.[210] There have been attempts to reform the immigration system to shift to a supply-driven mechanism, but Democratic lawmakers largely favour keeping the current system which prioritizes family reunification, whereas Republican lawmakers have favoured switching to a supply-driven system, which would favour more highly-skilled immigrants.[211]

The H-1B visa system allows U.S. corporations to temporarily employ skilled foreigners in specialized occupations (usually defined as requiring a bachelor's degree at minimum) and there is a possibility that employers can sponsor workers on H-1B visas for permanent residency, commonly known as a "green card." In recent years, 70% of H-1B visas have gone to STEM occupations[212] where the applications are mostly concentrated in information technology, the pharmaceutical industry, and the financial sector.[213] This visa is valid for 3 years and can be renewed once.[214] Employers are obligated to pay the prevailing wage for the profession so as not to undercut domestic talent and H-1B workers are paid well,[215] with the median wage of around U.S. $108,000 compared to for all U.S. workers calculated at $45,760 in 2021.[216]

[210] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4), 99
[211] Yoland Pottie-sherman, "Talent for Citizenship and the American Dream: The USA as Outlier in the Global Race for Talent," *Journal of International Migration and Integration* 14, no. 3 (08, 2013): 557-575
[212] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4) 98
[213] González Marcela F, "Precarity for the Global Talent: The Impact of Visa Policies on High-skilled Immigrants' Work in the United States," *International migration* (2021).
[214] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4) 99
[215] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4) 99
[216] The Economic Times, "H-1B visa holders are among the highest paid workers in the United States," April 12, 2022, https://economictimes.indiatimes.com/nri/work/h-1b-visa-holders-are-among-the-highest-paid-workers-in-the-united-states/articleshow/90801291.cms?from=mdr

The L-1 visa allows for temporary migration of employees of international companies.[217] 76,988 L-1 visas were issued in the pre-pandemic 2019, and 24,863 in 2021.[218] Applicants must have worked for the company for at least one year abroad, and may stay in the U.S. for up to 7 years.[219] There is also a possibility for employer green card sponsorship. For workers who possess extraordinary talent or abilities but are not eligible or do not wish to go through the process for a H-1B or L-1 visa, the U.S. also offers the O-1 visa,[220] of which 17,751 in 2019 and 7,294 in 2021, were issued.[221]

Spotlight: The H-1B Skilled Visa.

The H-1B highly skilled visa is a principal instrument that the U.S. employs to allow global talent to work within the country. This program is overwhelmingly used by research universities, research institutes and high-tech companies, including the largest tech companies in the U.S.: Apple, Microsoft, Amazon, Google, and Facebook.[222]

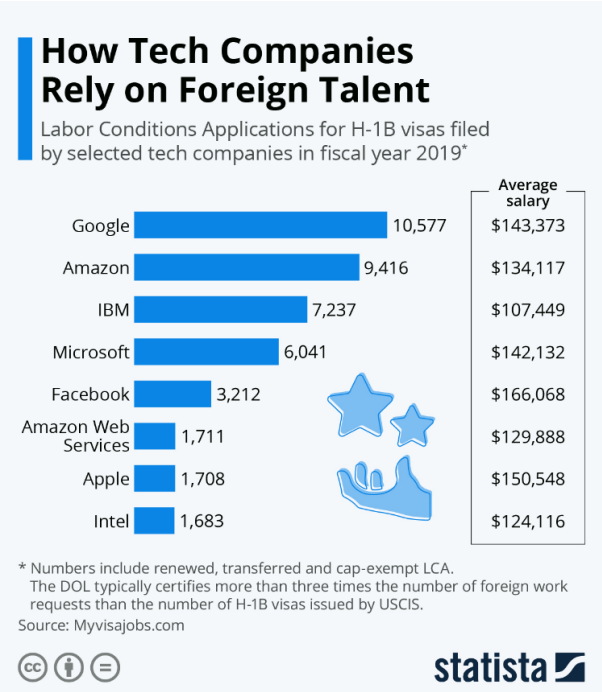

Figure 3 H-1B Visa Applications by Company (Statista)

The number of H-1B visa issued each year is subject to a strict cap. Since 2005 there have been 65,000 visas available each year, plus an additional 20,000 visas for those with graduate degrees earned at an

[217] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4) 99
[218] United States Department of State: Bureau of Consular Affairs, "Table XV(B) Nonimmigrant Visas Issued by Classification (Including Border Crossing Cards) Fiscal Years 2017-2021," 2022, 2, https://travel.state.gov/content/dam/visas/Statistics/AnnualReports/FY2021AnnualReport/FY21_%20TableXVB.pdf
[219] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4) 99
[220] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Perspectives*, 2016, 30(4), 99
[221] United States Department of State: Bureau of Consular Affairs, "Table XV(B) Nonimmigrant Visas Issued by Classification (Including Border Crossing Cards) Fiscal Years 2017-2021," 2022, 3, https://travel.state.gov/content/dam/visas/Statistics/AnnualReports/FY2021AnnualReport/FY21_%20TableXVB.pdf
[222] Andrew Kennedy, "The Politics of Skilled Immigration: Explaining the Ups and Downs of the U.S. H-1B Visa Program," *International Migration Review* 53, no. 2 (June 2019): 346–70.

American university.[223] As of 2021, it is reported that from fiscal year 2008 to 2020, the annual H-1B cap was reached within the first five business days on eight occasions.[224] Applications are submitted by employers and employers must also pay an application fee of up to $6460 USD if their application is successful. Although H1-B visa numbers have fluctuated alongside economic growth and contraction in the past, every year since 2014, applications exceeded the quota, and as such, the visas were distributed through a lottery system.[225] The number of applications reached a peak of 236,000 in 2017 meaning that there was just one visa available for nearly 3 (2.8) applications.[226]

The hard cap indicates that despite surging demand for global talent, whether or not firms are able to hire this global talent, falls to an arbitrary lottery system rather than these applications being evaluated on their own merit.[227] If this situation continues, American companies will continue to be unable to hire the global talent they need, which leads to stifling innovation. Higher education institutions are exempt from the H1-B visa cap in order to retain global talent in the academic sector, yet research has shown that this exemption is pushing highly-skilled migrants to pursue careers in academia due to the scarcity of private sector visas.[228] The cap therefore distorts the career paths of highly-skilled migrants by inserting barriers to enter the private sector.[229] The H1-B visa quota has not been increased since 2005 despite 15 years of economic and population growth. Increasing or eliminating the cap would help match the supply of visa meet employer

[223] Neil G. Ruiz, "Key facts about the U.S. H-1B visa program," *Pew Research Centre*, April 27, 2017, https://www.pewresearch.org/fact-tank/2017/04/27/key-facts-about-the-u-s-h-1b-visa-program/
[224] American Immigration Council, "The H-1B Visa Program: A Primer on the Program and Its Impact on Jobs, Wages, and the Economy," May 26, 2021, https://www.americanimmigrationcouncil.org/sites/default/files/research/the_h1b_visa_program_a_primer_on_the_program_and_its_impact_on_jobs_wages_and_the_economy_0.pdf
[225] Andrew Kennedy, "The Politics of Skilled Immigration: Explaining the Ups and Downs of the U.S. H-1B Visa Program," *International Migration Review* 53, no. 2 (June 2019): 346–70.; Neil G. Ruiz, "Key facts about the U.S. H-1B visa program," *Pew Research Centre*, April 27, 2017, https://www.pewresearch.org/fact-tank/2017/04/27/key-facts-about-the-u-s-h-1b-visa-program/
[226] Neil G. Ruiz, "Key facts about the U.S. H-1B visa program," *Pew Research Centre*, April 27, 2017, https://www.pewresearch.org/fact-tank/2017/04/27/key-facts-about-the-u-s-h-1b-visa-program/
[227] Emily C. Callan, "Is the game still worth the candle (or the visa)? How the H-1B visa lottery lawsuit illustrates the need for immigration reform," *Albany Law Review*, Fall 2016, 335+. Gale Academic OneFile (accessed October 9, 2020).
[228] Amuedo-Dorantes, Furtado. "Settling for Academia? H-1B Visas and the Career Choices of International Students in the United States." The Journal of human resources 54, no. 2 (2019): 401–429.
[229] Amuedo-Dorantes, Furtado. "Settling for Academia? H-1B Visas and the Career Choices of International Students in the United States." The Journal of human resources 54, no. 2 (2019): 401–429.

demand, but despite bipartisan attempts in congress to do so, none have been successful thus far.[230] The high-tech companies who utilize the H1-B visa extensively have supported efforts to expand the program, whereas citizen and labour groups representing domestic workers in affected industries have lobbied to oppose such expansion.[231]

In some cases, H-1B visas have created conditions for exploitation of workers. H1-B visa holders often are in precarious situations because of their visa status; their employer sponsors their visa and thus likely work for lower pay and are unable to speak up about workplace issues.[232] Some H1-B visas are used by outsourcing companies which may use H1-B workers to provide services at a lower cost, and potentially displacing American workers.[233] In 2014, seven Indian firms operating in the U.S. received 16,573 of the 85,000 H1-B visas available, and these companies supply these workers as contingent labour to major U.S. companies.[234] It is for these reasons that H1-B visa reform has become a highly contentious issue, as there is strong disagreement about the role that the H1-B visa plays in the labour market.

Since 2001, 50% of H-1B visa holders have been Indian nationals, 9.7% Chinese, 3.8% Canadian, 3% Filipino and 2.8% South Korean.[235] This indicates that the majority of highly skilled H1-B visa holders come from middle income countries, and most of those remaining come from high-income countries.

During the Trump Administration, the H-1B visa program faced a lot of scrutiny. In 2017, the president signed multiple executive orders intended to provide domestic businesses an economic boost, which mainly scrapped regulations concerning hiring practices, carbon emissions and banking compliance. The headline

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[230] Emily C. Callan, "Is the game still worth the candle (or the visa)? How the H-1B visa lottery lawsuit illustrates the need for immigration reform," *Albany Law Review*, Fall 2016, 335+. Gale Academic OneFile (accessed October 9, 2020).
[231] Andrew Kennedy, "The Politics of Skilled Immigration: Explaining the Ups and Downs of the U.S. H-1B Visa Program," *International Migration Review* 53, no. 2 (June 2019): 346–70.
[232] Ontiveros, Maria. "H-1B Visas, Outsourcing and Body Shops: a Continuum of Exploitation for High Tech Workers." Berkeley journal of employment and labor law 38, no. 1 (June 22, 2017): 1–47.
[233] Ontiveros, Maria. "H-1B Visas, Outsourcing and Body Shops: a Continuum of Exploitation for High Tech Workers." Berkeley journal of employment and labor law 38, no. 1 (June 22, 2017): 1–47.
[234] Andrew Kennedy, "The Politics of Skilled Immigration: Explaining the Ups and Downs of the U.S. H-1B Visa Program," *International Migration Review* 53, no. 2 (June 2019): 346–70.
[235] Neil G. Ruiz, "Key facts about the U.S. H-1B visa program," *Pew Research Centre*, April 27, 2017, https://www.pewresearch.org/fact-tank/2017/04/27/key-facts-about-the-u-s-h-1b-visa-program/

announcement "Buy American, Hire American" aimed to tighten standards for federal procurement departments, as well as companies hiring foreign workers.[236] It focused the Immigration System to prioritize American workers, and mandated that key government departments advised on potential H-1B visa system reforms to ensure visas go to only the most-skilled or highly-paid applicants.[237] Policy directives at United States Citizenship and Immigration Services also dictated stricter guidelines for approval of visas, as well as re-examination of already-approved H-1B applications.[238]

The administration's stricter policy towards H-1B visas approval resulted in the refusal rate going from 10% in financial year 2016 and 13% in 2017, before the order took effect, to 24% in 2018 and 21% in 2019.[239] At the same time, the rate of overturning of visa refusals has also increased sharply. The USCIS Administrative Appeals Office, which applicants can ask to have their cases re-examined if their visa application is denied, overturned about 3% of all H-1B visa decisions that were appealed from 2014 to 2017.[240] In 2018, the year after the "Buy American, Hire American" executive order was issued, the appeals office overturned nearly 15% of all appealed H-1B decisions.[241] Decisions on H-1B applications were made on an increasingly arbitrary and restrictive basis under the executive order, which is considered to have brought a concern for further constrains the U.S.'s ability to attract and retain global talent.

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[236] Connor DiGregorio, "Buy American, Hire American: How Renewed Protectionism is Reshaping Supply Chains," *Industry Week* (2017), 1-4, 1

[237] The White House, "Presidential Executive Order on Buy American and Hire American," April 18, 2017, https://www.whitehouse.gov/presidential-actions/presidential-executive-order-buy-american-hire-american/

[238] Sinduja Rangarajan, "Trump administration's denials of H-1B visas are being overturned at record rate," *Reveal*, October 17, 2019, https://www.revealnews.org/article/trump-administrations-denials-of-h-1b-visas-are-being-overturned-at-record-rate/

[239] Priyanka Sangani, "Joe Biden revokes buy American, hire American order, eases path to H-1B," *The Economic Times*, February 3, 2021, https://economictimes.indiatimes.com/nri/work/biden-revokes-buy-american-hire-american-order/articleshow/80653866.cms?from=mdr

[240] Sinduja Rangarajan, "Trump administration's denials of H-1B visas are being overturned at record rate," *Reveal*, October 17, 2019, https://www.revealnews.org/article/trump-administrations-denials-of-h-1b-visas-are-being-overturned-at-record-rate/

[241] Sinduja Rangarajan, "Trump administration's denials of H-1B visas are being overturned at record rate," *Reveal*, October 17, 2019, https://www.revealnews.org/article/trump-administrations-denials-of-h-1b-visas-are-being-overturned-at-record-rate/

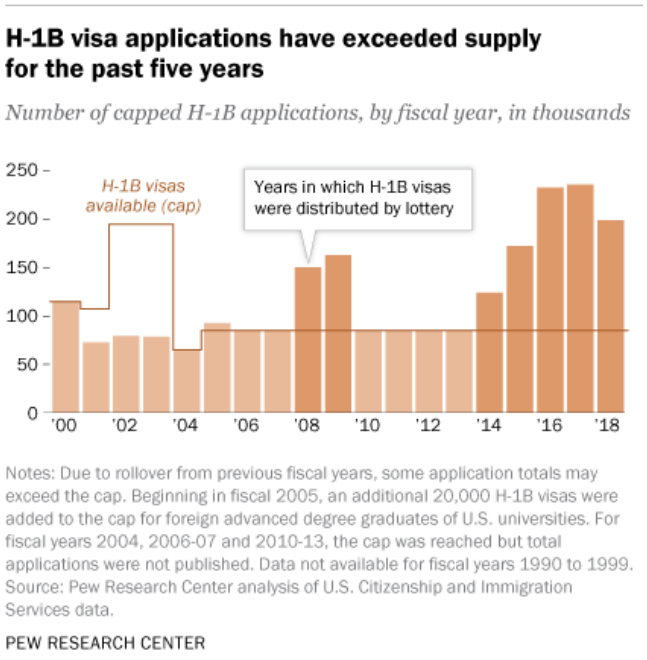

Figure 5 H-1B Visa Applications by Year (Pew Research Centre)

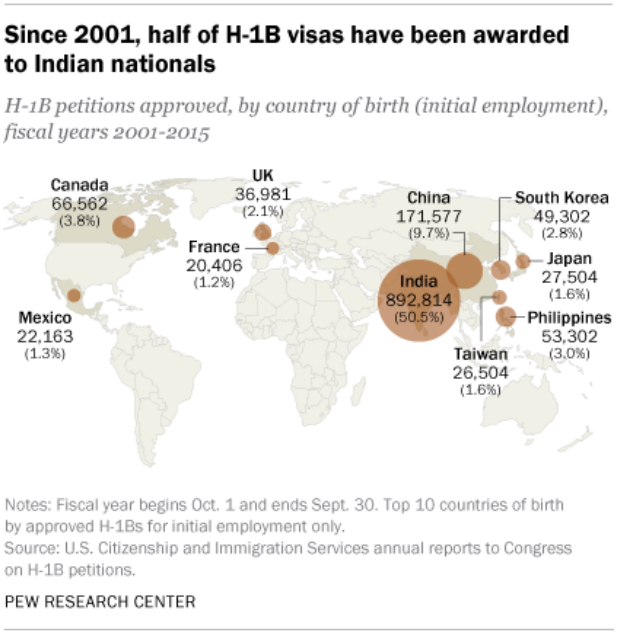

Figure 5 H-1B Visas by Nationality (Pew Research Centre)

The Trump administration also further clamped down on non-immigration work visas in the wake of the COVID-19 pandemic and recession. A June 22 executive order in 2020 banned the entry of any new H-1B, H-2B, J or L visas until the end of 2020.[242] This action was criticized by the leaders of several major tech companies, which rely on H-1B visas to employ global talent.[243]

In the post Trump period, H-1B denial rate has recovered to previous levels. In the first two quarters of fiscal year 2021, from October 1, 2020 to March 31, 2021, specifically, the refusal rate for new H-1B petitions for initial employment dropped to 7.1%, compared to 28.6% through the same period in the

[242] "Proclamation Suspending Entry of Aliens Who Present a Risk to the U.S. Labor Market Following the Coronavirus Outbreak," The White House, June 22, 2020, https://www.whitehouse.gov/presidential-actions/proclamation-suspending-entry-aliens-present-risk-u-s-labor-market-following-coronavirus-outbreak/
[243] Felix Richter, "How Tech Companies Rely on Foreign Talent," *Statista*, June 23, 2020, https://www.statista.com/chart/7863/tech-company-h-1b-applications/

previous year.[244] In January 2021, President Biden signed an executive order to strengthen manufacturing in the U.S., resulting in Trump's "Buy American and Hire American" policy being revoked as part of the order.[245] The Biden administration also lifted the suspension of entry that the previous administration had set in response to the COVID-19 pandemic, declaring that those bans do not advance the interest of the country, but harm U.S. citizen families, U.S. industry, and individuals that were eligible for the Fiscal Year 2020 Diversity Visa Lottery.[246] In contrast to the previous administration, it is expected that the trend that relatively favors immigrants will continue under the Biden government.

Spotlight: The F-1 Visa for Students and Optional Practical Training (OPT) Program.

The U.S. has long been one of the most popular and attractive destinations for international students. In 2013, the U.S. hosted 19% of the world total of international students.[247] International students made up 4% of the U.S. university and college enrollment in 2013, albeit it was a much lower ratio than in other jurisdictions like Australia (25%), England (19%), and Canada (11%).[248] Their presence made a significant contribution to the American economy; international students contributed $41 billion to the U.S. economy and supported 458,290 jobs in the 2018/2019 academic year.[249] International students also make up for a lack of American students studying STEM fields, as 51.6% of all international students pursued a STEM field in 2018/2019.[250]

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[244] Stuart Anderson, "Low H-1B Visa Denial Rates Are Trump's Failed Immigration Legacy," *Forbes*, April 30, 2021, https://www.forbes.com/sites/stuartanderson/2021/08/30/low-h-1b-visa-denial-rates-are-trumps-failed-immigration-legacy/?sh=15137fe62c83a

[245] Priyanka Sangani, "Joe Biden revokes buy American, hire American order, eases path to H-1B," *The Economic Times*, February 3, 2021, https://economictimes.indiatimes.com/nri/work/biden-revokes-buy-american-hire-american-order/articleshow/80653866.cms?from=mdr

[246] The White House, "A Proclamation on Revoking Proclamation 10014," *Briefing room,* February 24, 2021, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/a-proclamation-on-revoking-proclamation-10014/

[247] Creso M. Sa and Emma Sabzalieva. "The Politics of the Great Brain Race: Public Policy and International Student Recruitment in Australia, Canada, England and the USA." *Higher education* 75, no. 2 (2018): 231–253, 233

[248] Creso M. Sa and Emma Sabzalieva. "The Politics of the Great Brain Race: Public Policy and International Student Recruitment in Australia, Canada, England and the USA." *Higher education* 75, no. 2 (2018): 231–253, 235

[249] NAFSA, "NAFSA International Student Economic Value Tool," Accessed October 10, 2020, https://www.nafsa.org/policy-and-advocacy/policy-resources/nafsa-international-student-economic-value-tool-v2

[250] Institute of International Education, "Number of International Students in The United States Hits an All-Time High," *iie*, November 18, 2019, https://www.iie.org/en/Why-IIE/Announcements/2019/11/Number-of-International-Students-in-the-United-States-Hits-All-Time-High

Unlike the other top international student destinations, the U.S. does not have an international student recruitment policy and instead largely relies on the strength of the global reputation of its top universities.[251] The issue of international student policy has become highly politicized, and therefore there has been little bipartisan consensus on adopting a policy to increase international student enrollment.[252] International students have also often been subjected to restrictions based on national security concerns in the past 20 years.[253]

International students who complete a STEM degree in the U.S. are also eligible for the Optional Practical Training (OPT) program.[254] This program was launched in 1992, expanded under the George W. Bush administration in 2008, and further extended in 2016 by the Obama administration so that students on OPT could stay up to 36 months in the U.S. after they graduated.[255] Prospective participants must find a eligible job before they graduate and receive approval, after which they may work in the U.S. for up to 3 years. Many of these students hope to then receive a H-1B visa and being able to work in the U.S. for 3 years allows them to find a company to sponsor them for the H-1B visa lottery multiple times.[256] The OPT program provides a path for global talent educated in American institutions to contribute to the American economy while earning practical skills in STEM occupations. The OPT visa has been highly popular in recent years with 223,085 OPT visa holders counted in 2018/2019, an increase of 9.6% from the previous year.[257] The OPT program has also found to be effective in increasing the proportion of international

[251] Creso M. Sa and Emma Sabzalieva. "The Politics of the Great Brain Race: Public Policy and International Student Recruitment in Australia, Canada, England and the USA." *Higher education* 75, no. 2 (2018): 231–253, 238
[252] Creso M. Sa and Emma Sabzalieva. "The Politics of the Great Brain Race: Public Policy and International Student Recruitment in Australia, Canada, England and the USA." *Higher education* 75, no. 2 (2018): 231–253, 239
[253] Creso M. Sa and Emma Sabzalieva. "The Politics of the Great Brain Race: Public Policy and International Student Recruitment in Australia, Canada, England and the USA." *Higher education* 75, no. 2 (2018): 231–253, 239
[254] U.S. Citizenship and Immigration Services, "Optional Practical Training (OPT) for F-1 Students," Accessed October 10, 2020, https://www.uscis.gov/working-in-the-united-states/students-and-exchange-visitors/optional-practical-training-opt-for-f-1-students
[255] Amy Merrick, "It's Getting Harder for International STEM Students to Find Work After Graduation," *The Atlantic,* September 22, 2018, https://www.theatlantic.com/business/archive/2018/09/stem-majors-jobs/568624/
[256] Amy Merrick, "It's Getting Harder for International STEM Students to Find Work After Graduation," *The Atlantic,* September 22, 2018, https://www.theatlantic.com/business/archive/2018/09/stem-majors-jobs/568624/
[257] Open doors, "Fast Facts 2019," Open Doors Data, 2019, https://opendoorsdata.org/fast_facts/fast-facts-2019/

students studying STEM fields in the U.S., the extension in the OPT period in 2008 was associated with international students in the U.S. becoming 18% more likely to study a STEM degree.[258]

The number of international students enrolled in the U.S. including those on OPT visas, hit a high of 1,095,299 in the 2018/2019 academic year.[259] However, the number of new international students has declined in recent years, suggesting that the U.S.' reputation as an international study destination may be fading. In 2018/2019, the number of new international students dropped for the third year in a row, declining by -0.9% in 2018/2019, -6.6% in 2017/2018 and -3.3% in 2016/2017.[260] Excluding students on OPT visas, there were 872,214 students studying in the U.S. in 2018/2019, a drop of -2.1% from the previous year. International students studying undergraduate degrees declined by -2.4% to 431,930 and those studying graduate degrees declined by -1.3% to 377,943.[261] Given the contribution that international students make to the U.S. economy, its universities, and as future global talent themselves, these numbers are concerning. Without a dedicated policy of attraction and retention, the U.S. will continue to lose students to other destinations which have invested resources in competing globally for international students. The COVID-19 pandemic further devastated international student numbers in the U.S., with Fall 2020 international enrollment predicted to drop by at least 25%.[262] In the end, enrollment at U.S. universities dropped 22.7% between the 2019-20 and 2020-21 academic years.[263]

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[258] Catalina Amuedo-Dorantes, Delia Furtado, and Huanan Xu. "OPT Policy Changes and Foreign Born STEM Talent in the U.S." *Labour economics* 61 (2019).
[259] Open doors, "Fast Facts 2019," Open Doors Data, 2019, https://opendoorsdata.org/fast_facts/fast-facts-2019/
[260] Institute of International Education, "Number of International Students in The United States Hits an All-Time High," *iie*, November 18, 2019, https://www.iie.org/en/Why-IIE/Announcements/2019/11/Number-of-International-Students-in-the-United-States-Hits-All-Time-High
[261] Institute of International Education, "Number of International Students in The United States Hits an All-Time High," *iie*, November 18, 2019, https://www.iie.org/en/Why-IIE/Announcements/2019/11/Number-of-International-Students-in-the-United-States-Hits-All-Time-High
[262] American Council on Education, "Higher Education Community Requests $46/6 Billion for Students and Institutions in Fourth Supplemental Package, Proposes Tax Changes," April 10, 2020, https://www.acenet.edu/News-Room/Pages/Higher-Education-Community-Requests-$47-Billion-for-Students-and-Institutions-Proposes-Tax-Changes.aspx
[263] Stuart Anderson, "U.S. International Student Enrollment Dropped as Canada's Soared", Forbes, March 23, 2022, https://www.forbes.com/sites/stuartanderson/2022/03/03/us-international-student-enrollment-dropped-as-canadas-soared/?sh=1378a9e5776e

Spotlight: Green Card System (Permanent Residency).

In order to attract and retain global talent long term, countries competing for these individuals must provide an accessible and timely path to permanent residency. The green card system that grants permanent residency in the U.S. has been under strain and backlogged for a long time. The average wait time to apply for a green card has doubled from 3 years in 1991, to 6 years in 2018.[264] In 2018, 28% of legal immigrants had waited more than a decade to be able to apply for a green card.[265]

Like many of its other immigration programs, the U.S. has strict quotas on green cards by both category and nationality.[266] The U.S. prioritizes family reunification rationales over employer-demand which means that U.S. permanent resident policy skews more towards lower skilled migrants than in peer countries.[267]. There are 226,000 green cards available on the basis of family reunification and 140,000 employment based green cards available each year.[268] Additionally, employment-based green card holders' dependants are counted towards the employment-based quota.[269]

The U.S. has a policy that green cards for any one nationality cannot exceed more than 7% of the total green cards issued each year. Once the yearly quota for a specific country is met, applicants from other countries are prioritized. This means that immigrants from the top sending countries of India, China, Mexico, and the Philippines face excessive wait times to apply for a green card. For example, Indian nationals faced an average wait time of 8 years and 6 months in 2018. In some cases, it is estimated that some Indian applicants could face a wait of up to 50 years, which will inevitably discourage skilled workers

[264] David J. Bier, "Immigration Wait Times from Quotas Have Doubled: Green Card Backlogs are Long, Growing, and Inequitable," *The Cato Institute,* June 18, 2019, https://www.cato.org/publications/policy-analysis/immigration-wait-times-quotas-have-doubled-green-card-backlogs-are-long
[265] David J. Bier, "Immigration Wait Times from Quotas Have Doubled: Green Card Backlogs are Long, Growing, and Inequitable," *The Cato Institute,* June 18, 2019, https://www.cato.org/publications/policy-analysis/immigration-wait-times-quotas-have-doubled-green-card-backlogs-are-long
[266] With the exception of immediate family of U.S. Citizens for which there are no limits.
[267] Sari Pekkala Kerr, William Kerr, Çag˘lar Özden, and Christopher Parsons, "Global Talent Flows," *Journal of Economic Prspectives*, 2016, 30(4) 100
[268] David J. Bier, "Immigration Wait Times from Quotas Have Doubled: Green Card Backlogs are Long, Growing, and Inequitable," *The Cato Institute,* June 18, 2019, https://www.cato.org/publications/policy-analysis/immigration-wait-times-quotas-have-doubled-green-card-backlogs-are-long
[269] Zavodny Orrenius, "Creating Cohesive, Coherent Immigration Policy," *Journal on migration and human security* 5, no. 1 August 8, 2018: 180–193.

from India from settling in the U.S.[270] According to the Department of Homeland Security, as of April 2020 there was a backlog of 1.2 million people waiting for employment-based green cards.[271] There were 463,027 waiting for green cards reserved for those with advanced degrees, of which there are only 40,040 green cards available each year.[272] Additionally, there were more than 65,000 waiting for an investor based green card of which there are 9,940 available each year, which indicates that the U.S. is missing out on valuable investment and job creation.[273]

The COVID-19 global pandemic since March 2020 has further exacerbated the situation, affecting the government's ability to process immigrant visa applications.[274] Although the U.S. has remained an attractive destination for global talent due to the strength of its economy and its quality of opportunities, the long waits in the green card system means that global talent is incentivized to settle in other destination countries with more reasonable and efficient permanent residency policies. Even though H1-B quotas have increased since the 1990 Immigration Act, the employment based green-card quota has remained unchanged.[275] The mismatch between the number of temporary work visas available and the limited number of green cards has forced employers to bring in new temporary workers rather than attempting to sponsor workers for permanent residency as employers cannot guarantee that green card applications will be successful or timely.[276] The green card backlog also causes the U.S. to potentially lose out on innovators, and some have

[270] Abigail Hauslohner, "Green Card Backlog Promises 50-Year Waits," *The Washington Post*, December 18, 2019.
[271] Stef W. Kight, "1 million waiting for employment-based green cards," *Axios,* September 12, 2020, https://www.axios.com/million-wait-employment-based-green-card-a2ae36a3-4bcb-451e-bdc9-9b8501a704e8.html?utm_source=twitter&utm_medium=social&utm_campaign=dd91220&utm_content=1100
[272] David J. Bier, "Immigration Wait Times from Quotas Have Doubled: Green Card Backlogs are Long, Growing, and Inequitable," *The Cato Institute,* June 18, 2019, https://www.cato.org/publications/policy-analysis/immigration-wait-times-quotas-have-doubled-green-card-backlogs-are-long
[273] David J. Bier, "Immigration Wait Times from Quotas Have Doubled: Green Card Backlogs are Long, Growing, and Inequitable," *The Cato Institute,* June 18, 2019, https://www.cato.org/publications/policy-analysis/immigration-wait-times-quotas-have-doubled-green-card-backlogs-are-long
[274] United States Department of State: Bureau of Consular Affairs, "National Visa Center (NVC) Immigrant Visa Backlog Report," October 2022, https://travel.state.gov/content/travel/en/us-visas/visa-information-resources/visas-backlog.html
[275] Zavodny Orrenius, "Creating Cohesive, Coherent Immigration Policy," *Journal on migration and human security* 5, no. 1 August 8, 2018: 180–193.
[276] Zavodny Orrenius, "Creating Cohesive, Coherent Immigration Policy," *Journal on migration and human security* 5, no. 1 August 8, 2018: 180–193.

predicted that long green card waits may be causing a "reverse brain drain" in the U.S.[277] Global talent will even be discouraged from accepting a temporary work or student visa in the U.S. if they are aware of the shortage of green cards.[278]

Like H-1B visas, green card quotas have remained unchanged in recent years and the system could become more equitable and efficient if these quotas were adaptive and tied to population and economic growth. The wait times and situation will only worsen if there continues to be an increasing number of applicants for the same number of green cards each year. In 2022, it is reported that the Biden administration is exploring the policy recommendations to reduce the adjudication and processing of Green Card applications to six months and eliminate all the backlogs by April 2023.[279] Furthermore, implementing a country-based quota risks arbitrarily denying global talent the ability to settle in America if they come from one of the top sending countries for global talent and this quota needs to be re-examined.

[277] Vivek Wadwa, Guillermina Jasso, Ben A. Rissing, Gary Gereffi, and Richard B. Freeman, *Intellectual Property, the Immigration Backlog, and a Reverse Brain-Drain: America's New Immigrant Entrepreneurs, Part III*, August 22, 2007, https://ssrn.com/abstract=1008366

[278] Zavodny Orrenius, "Creating Cohesive, Coherent Immigration Policy," *Journal on migration and human security* 5, no. 1 August 8, 2018: 180–193.

[279] The Economic Times, "White House looking into recommendations to reduce Green Card adjudication and processing time", September 24, 2022, https://economictimes.indiatimes.com/nri/migrate/white-house-looking-into-recommendations-to-reduce-green-card-adjudication-and-processing-time/articleshow/94411505.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

IV. Stakeholder Viewpoints

The following is a summary of key themes and recommendations based on a variety of sources, such as industry reports, policy statements, and media coverage on skilled foreign workers, as well as interviews with pertinent stakeholders. Stakeholders mainly included individuals that have direct experience with the U.S. immigration system whether recruiting talent or being part of the talent recruited. While the viewpoints and insights of the individuals representing specific stakeholders are not representative of the situation of all other stakeholders across the U.S. clusters, a number of discrete themes were identified from these discussions that were consistent with the statements in open-source material and complementary to the narrative that emerged from this research. Ultimately, this section focuses on several major discussions relevant to the interest of our report and the capacity for the United States of America to enhance the attraction and retention of global talent.

4.1 Business groups request an immigration overhaul to attract and retain global talent

A significant number of business associations in the U.S. claim that today's national immigration policy does not meet the needs of America's businesses and employers. Business Roundtable, one of the most notable business associations in the U.S., whose members consist of CEOs of America's leading companies, claims that the U.S. is falling behind in the race for global talent. Business Roundtable members believe that one of the most crucial factors in supporting U.S. employers to grow their businesses is their ability to recruit and retain talent from other countries.[280] However, despite being often referred to as 'the country of immigrants', the U.S. ranked 9th out of 10 advanced economies when evaluating national immigration policies to promote economic growth (Japan, a country historically closed to outsiders, placed 10th in this

[280] Business Roundtable, "The state of immigration," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration

ranking).[281] Thus, Business Roundtable calls for the U.S. government to overhaul its immigration system for the purpose of intensifying the U.S.' capacity to compete for skills and talents.

This is further corroborated by the U.S. Chamber of Commerce, the world's largest business organization representing the interests of more than 3 million businesses across a wide range of sizes, sectors, and regions. This organization also claims that, despite the fact that the U.S. has grown in welcoming the hardest working and most talented people to the country's shores, the current U.S. immigration system falls far short of meeting the needs of their society, economy, businesses, and workers.[282]

Business Roundtable also noted several key points and suggested that policymakers should create a new visa classification for immigrant entrepreneurs,[283] pointing out that no genuine immigration category exists for entrepreneurs in the country despite the entrepreneurial spirit of the American economy.[284] Hiring high-skilled foreign nationals enables employers to access skills that is not easily accessible domestically and is complementary to the skills of native-born workers.[285] Yet, in the U.S., the only practical way to hire high-skilled foreign workers long term is on an H-1B visa, which has proven to be a challenge under a limiting quota system.[286]

As such, the policy recommendations made by Business Roundtable point towards the need for a nimbler immigration system that avoids overly bureaucratic rules. More concretely, this would entail reducing the employment-based green card backlog by "recapturing" unused visas caused by processing delays from prior fiscal years, exempting the dependents of those sponsored from counting against the annual quota, and eliminating the per-country limit. Additionally, Business Roundtable highlights the need to simply increase

[281] Business Roundtable, "The state of immigration," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration
[282] U.S. Chamber of Commerce, "Immigration," 2021, https://www.uschamber.com/immigration
[283] Business Roundtable, "The state of immigration," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration
[284] Business Roundtable, "Attracting foreign entrepreneurs," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/attracting-foreign-entrepreneurs
[285] Business Roundtable, "Hiring high-skilled foreign nationals," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/hiring-high-skilled-foreign-nationals
[286] Business Roundtable, "Hiring high-skilled foreign nationals," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/hiring-high-skilled-foreign-nationals

the cap for H-1B visas.[287] This would be consistent with its neighbour's (Canada's) approach. Canada has increased its caps to over 100,000 visas per year in its Express Entry program, while the U.S. still has an annual cap of 65,000 visas plus an additional 20,000 more for J-1 graduate degree holders. In the last year, the U.S. received over 480,000 applications for H1-B visas and for which it used a lottery to select only a quarter of those for review[288]

Noting that the U.S. sets quotas and limits for permanent residence unlike other competitors for global talent and those workers need to pass a test similar to the U.S. naturalization exam after five years of working experience in the country, Business Roundtable claims that employers and employees require more predictability.[289] They also state that low quotas lead to a waiting time between 6 to 10 years or longer and great uncertainty for many applicants, and employer costs to sponsor an individual can exceed $50,000.[290]

The Institute of Electrical and Electronics Engineers (IEEE-USA), which represents over 200,000 engineering, computing and technology professionals, as well as students in the U.S. in these fields, also states that immigration must mean Green Cards because America should not be seen as a nation of guest workers.[291] They questioned the situation skilled foreign workers face as they compete with the salaries of workers outsourced offshores, as well as their reduced agency as they cannot petition for green cards without the backing of an employer.[292] They further question the effectiveness of temporary work permits, such as

[287] Business Roundtable, "The state of immigration," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration
[288] https://www.protocol.com/braintrust/national-innovation-strategy-borrowed-policies?rebelltitem=2#rebelltitem2
[289] Business Roundtable, "Lawful permanent residence for high-skilled workers," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/attracting-foreign-entrepreneurs
[290] Business Roundtable, "Lawful permanent residence for high-skilled workers," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/attracting-foreign-entrepreneurs
[291] IEEE-USA, "TESTIMONY OF Peter A. Eckstein: on behalf of IEEE-USA for the hearing on the Impact of High-Skilled Immigration on U.S. Workers presented to the Senate Judiciary Committee Subcommittee on Immigration and the National Interest," February 25, 2016, http://r1.ieee.org/wp-content/uploads/2018/08/Eckstein-Written-Testimony-Final-2-26-16.pdf from IEEE-USA, "IEEE-USA's Stance on the H-1B Visa Program," August 27, 2018, https://r1.ieee.org/2018/08/27/ieee-usas-stance-on-the-h-1b-visa-program/
[292] Karen Pederson, Pete Eckstein and Candy Robinson, "Green cards are a better way to bring in skilled workers," April 21, 2017, from IEEE-USA, "IEEE-USA's Stance on the H-1B Visa Program," August 27, 2018, https://r1.ieee.org/2018/08/27/ieee-usas-stance-on-the-h-1b-visa-program/

the H-1B, as prospects for the future are limited and do not foster innovation; these temporary workers are limited in their resources to start businesses, unlike permanent residents, due to the visa regulations.[293]

Moreover, Business Roundtable sees the U.S falling behind other economies in its approach to attracting and retaining talent through the international student pipeline, as they are subject to the limited number of H-1B visas and the long waits for employment-based green cards.[294] Even though international students have the opportunity to be part of the Optional Practical Training (OPT) program upon graduation, especially for those in STEM fields, deficiencies in the immigration programs available still hinder their ability to properly integrate into the labour market.[295]

Similar to experts in the private sector and academia, major business lobbying groups also have a shared recognition that the U.S. should re-examine the immigration system in place in order by addressing backlogs and strict caps. As Luke Hogg (Policy Manager at Lincoln Network focusing on the intersection of technological innovation and public policy) stated "There is no panacea to ensuring that the United States' immigration system attracts and retains the best and brightest foreign talent […] Without STEM talent, we have little hope of maintaining our global competitiveness in frontier tech."[296] Stakeholders on the business and employer side thus agree on the need for comprehensive visa reform, which is consistent with the tech talent's side of the equation as explored in the sections below.

[293] Karen Pederson, Pete Eckstein and Candy Robinson, "Green cards are a better way to bring in skilled workers," April 21, 2017, from IEEE-USA, "IEEE-USA's Stance on the H-1B Visa Program," August 27, 2018, https://r1.ieee.org/2018/08/27/ieee-usas-stance-on-the-h-1b-visa-program/

[294] Business Roundtable, "Retention of international students to postgraduation," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/retention-of-international-students-postgraduation

[295] Business Roundtable, "Retention of international students to postgraduation," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration/retention-of-international-students-postgraduation

[296] Luke Hogg, "Immigration Could Decide the U.S.-China Artificial Intelligence Race", *National Interest,* April 10, 2022, https://nationalinterest.org/blog/techland-when-great-power-competition-meets-digital-world/immigration-could-decide-us-china

4.2 Businesses recognize the value added by immigration to U.S. society and economy to fill the growing labour shortage and enhance innovation

As part of the measures in place to prevent the spread of the COVID-19 virus, like many other countries, the U.S. limited the immigration flow for a long period, exacerbating the labour shortage and highlighting the importance of immigration. In June 2021, the U.S. Chamber of Commerce launched a nationwide initiative to address the national worker shortage crisis, announcing that there were half as many available workers for every open job across the country, as there have been on average over the past 20 years (2.8).[297] In some states and industries, especially hard-hit sectors such as education and health services as well as professional and business services, saw even fewer job seekers than the total number of jobs open.[298] Moreover, 91% of state and local chambers of commerce stated that worker shortages are holding back their economies and 83% of industry association economists said employers in their sectors found it more difficult to fill jobs than they were five years ago.[299] According to a poll that the U.S. Chamber of Commerce and MetLife conducted, more than half of small businesses who were looking for workers could not find them.[300] In 2021, Linda Moore, President and CEO Technet, highlighted that there were 2.5 million jobs openings for which there were no talented, skilled individuals and that the local talent pool was unable to fill this gap, even by upscaling the American workforce through training.[301]

Many firms have stated their support for incoming foreign labour as a means of enhancing innovation and competitiveness. According to Andrew Tisch, Co-Chairman of the Board and Chairman of the Executive Committee of Loews Corp, limiting the source of foreign talent is an unnecessary barrier to progress as we

[297] U.S. Chamber of Commerce, "U.S. Chamber Launches Nationwide Initiative to Address National Worker Shortage Crisis and Help America's Employers Fill Jobs," June 1, 2021, https://www.uschamber.com/workforce/education/us-chamber-launches-nationwide-initiative-address-national-worker-shortage-crisis-and
[298] U.S. Chamber of Commerce, "U.S. Chamber Launches Nationwide Initiative to Address National Worker Shortage Crisis and Help America's Employers Fill Jobs," June 1, 2021, https://www.uschamber.com/workforce/education/us-chamber-launches-nationwide-initiative-address-national-worker-shortage-crisis-and
[299] U.S. Chamber of Commerce, "U.S. Chamber Launches Nationwide Initiative to Address National Worker Shortage Crisis and Help America's Employers Fill Jobs," June 1, 2021, https://www.uschamber.com/workforce/education/us-chamber-launches-nationwide-initiative-address-national-worker-shortage-crisis-and
[300] Sean Hackbarth, "Why Immigration Reform Matters to Local Communities," *U.S. Chamber of Commerce*, July 26, 2021, https://www.uschamber.com/immigration/why-immigration-reform-matters-local-communities
[301] Sean Hackbarth, "Why Immigration Reform Matters to Local Communities," *U.S. Chamber of Commerce*, July 26, 2021, https://www.uschamber.com/immigration/why-immigration-reform-matters-local-communities

see fewer working-age adults, resulting in less production and innovation, key for economic growth.[302] Additionally, Kenny Nguyen, CEO of ThreeSixtyEight and Member of Chamber Small Business Council, explained that the diverse perspective of immigrants is extremely valuable, especially in the marketing and advertising business.[303]

4.3 Stakeholders further recognize the potential to leverage learning institutions to funnel foreign talent through the international student pipeline

Jack Corrigan, research analyst at Georgetown University's Center for Security and Emerging Technology (CSET), noted the U.S. tech industry's heavy reliance on foreign talent, and the fact that it has the U.S. university system to thank "for this abundance of talented immigrants."[304] He further observed that, based on numbers from the U.S. Department of Education, in 2020, international students earned 40 percent of STEM master's degrees and 43 percent of STEM PhDs. [305] American politicians, more specifically the House of Representatives, recognized the opportunity to leverage this source of talent with an earlier version of the CHIPS and Science Act. In the version known as the America COMPETES Act, the bill sought to create a new visa program that would enable around 3,000 foreign entrepreneurs each year to pursue their startup ideas in the U.S. and streamline the Green Card pathway for immigrants with PhDs in STEM fields.[306] Alas, contrary to expert recommendations, the final version excluded these immigration related measures.

[302] Sean Hackbarth, "Why Immigration Reform Matters to Local Communities," *U.S. Chamber of Commerce*, July 26, 2021, https://www.uschamber.com/immigration/why-immigration-reform-matters-local-communities
[303] Sean Hackbarth, "Why Immigration Reform Matters to Local Communities," *U.S. Chamber of Commerce*, July 26, 2021, https://www.uschamber.com/immigration/why-immigration-reform-matters-local-communities
[304] Jack Corrigan, "The advantages of foreign STEM students staying in the US", *The Hill*, June 14, 2022, https://thehill.com/opinion/immigration/3522679-the-advantages-of-foreign-stem-students-becoming-us-citizens/
[305] Jack Corrigan, "The advantages of foreign STEM students staying in the US", *The Hill*, June 14, 2022, https://thehill.com/opinion/immigration/3522679-the-advantages-of-foreign-stem-students-becoming-us-citizens/
[306] Dick Burke and Ray Walia, "America's largest employers are sounding the alarm on immigration rules. Canada's successful startup visa program shows us why", *Fortune,* August 19, 2022, https://fortune.com/2022/08/19/chips-act-us-employers-tech-talent-immigration-rules-canada-startup-visa-program/

In a survey-based research report written in March 2022 for Interstride, "Is studying in the U.S. worth it? International students on the "value" of their U.S. education experience,"[307] Anna Esaki-Smith, co-founder of Education Rethink, found that a majority (73%) of prospective international students in the U.S. in 2021 said they would stay to live and work if they were graduating from their degree program today and a visa were easily accessible to them. Nearly 4 in 10 prospective students said they would like to live in the U.S. for four years or longer after graduation; longer than the OPT program, the main postgraduate work program, currently permits.[308] This finding was consistent with the views of those interviewed for this report. However, Esaki-Smith's research highlighted that only about half of surveyed students (49%) studying in the U.S. at the time saw the post-graduation prospects as adequate return on their investment, pointing to the challenges in obtaining the required documentation to stay in the U.S. to work after graduation.

The hurdles posed by the U.S. immigration system are well known to American employers. One of the stakeholders interviewed, Professor Dennis Whyte, a Canadian-born professor of Nuclear Science and Engineering at the Massachusetts Institute of Technology, commented on the need to have a significant budget to ensure that foreign researchers have adequate legal advice when immigrating (i.e. to obtain a visa or Green Card) and be able to recruit talent to stay ahead of competitors. He further observed that the system is unlikely to change due to the politics surrounding the matter. Researchers will simply deal with the hurdles imposed by the immigration system as funding, often from the government itself, continues to be injected into the system for this purpose. [309]

In another interview with a stakeholder who has had experience recruiting and overseeing teams, he noted that it was more challenging to hire foreign talent for entry level positions. Realistically, only those with master's and higher-level degrees could be targeted, because to sponsor them it is necessary to prove that

[307] Anna Esaki-Smith, "Is Studying in the U.S. Worth it?", *Interstride, 2022,* https://www.interstride.com/researchreport/
[308] ICEF Monitor, "Most international students in the US want to stay after graduation but worry about getting a job". March 23, 2022, https://monitor.icef.com/2022/03/most-international-students-in-the-us-want-to-stay-after-graduation-but-worry-about-getting-a-job/
[309] Stakeholder Interview, Dennis Whyte

their position cannot be filled by the domestic labour pool. Moreover, business decisions must consider possible consequences on employees under a temporary immigration status, as changes to requirements could jeopardize their visa – making them less attractive to employers in general.[310] However, this stakeholder observed that the system sometimes provides negative incentives for retention, which may prove attractive to employers; for example, workers sponsored by an employer on a temporary visa will have to find another sponsor if they want to change employers and remain in the U.S. In this same interview, another stakeholder noted that some OPT contractors may find themselves in jobs with no benefits where they are not adequately remunerated because it is the only employer that will allow them to stay in the U.S.

SPOTLIGHT – The additional challenge of enduring discrimination

Stakeholders interviewed noted that, in addition to the stress caused by the bureaucratic requirements to remain in the U.S. post-graduation and the precarious situation some faced,[311] there were other elements that mapped out covert xenophobic tendencies. These stakeholders reported negative encounters with locals (e.g. authorities and recruiters) that fostered an unwelcoming environment. This is consistent with the national polls and the immigration rhetoric under then-President Trump. While there has been a rise in pro-migrant sentiments, particularly under now-President Biden, there is still some resistance.

According the 2021 Gallup poll, a vast majority of people in the U.S., 75%, believe immigration is a good thing for the country while only 21% see it as a bad thing.[312] 33% of participants think that immigration should be increased, while 31% think it should be decreased and 35% say it should be kept at its present level, though there are more Republicans who seek a decrease in immigration (54%) than Democrats (13%).[313] In particular, the number of people who think immigration should be increased has been steadily growing over the years; it exceeded 10% in 1999 for the first time since Gallup started their survey on this

[310] Stakeholder Interview, Amaro Taylor-Weiner
[311] Stakeholder Interview, Natalia Diaz
[312] Gallup, "Immigration," *News*, 2021, https://news.gallup.com/poll/1660/immigration.aspx
[313] Gallup, "Immigration," *News*, 2021, https://news.gallup.com/poll/1660/immigration.aspx

in 1965, and it passed 20% in 2012.[314] People who find immigration is a good thing has been over 70% every year since 2015, with the highest record of 77% in 2020, while those think it is a bad thing has been under 25% since 2017, marking 19% in 2018, 2019, and 2020.[315]

The main discussion concerning immigration policy differences between the past three administrations, Obama, Trump, and Biden, is often about undocumented immigrants. It is generally thought that the Obama and Biden administrations have relaxed regulations due to humanitarian considerations, while the Trump administration from the Republican Party tended to be strict against those immigrants. This trend was consistent with the American general immigration policy framework, which would include work and study visas, as well as the Green Card system. Under president Trump, officials suspended a number of immigration policies including the H-1B program, the most fundamental visa for high skilled foreign workers. Of note, several business groups and universities, including the U.S. Chamber of Commerce, the National Association of Manufactures, National Retail Federation, Stanford University, Cornell University, the University of Rochester, University of Southern California, and University of Utah, filed a lawsuit against the Trump administration on October 19 in 2020 to challenge updated regulations restricting immigration through the H-1B visa.[316]

The plaintiffs in the suit alleged that the then-president Trump exceeded presidential authority when he signed an executive order on July 22, 2020, to suspend the entry of those who hold H-1B, L-1, and other temporary work permit visas to the U.S. until December 31 in that year.[317] Thomas Donohue, CEO of the U.S. Chamber of Commerce, contended that this restriction would decrease all sorts of skilled workers who come to the country legally to contribute to the U.S. economy.[318] The plaintiffs claimed that, not only would

[314] Gallup, "Immigration," *News*, 2021, https://news.gallup.com/poll/1660/immigration.aspx
[315] Gallup, "Immigration," *News*, 2021, https://news.gallup.com/poll/1660/immigration.aspx
[316] Aman Kidwai, "US Chamber, universities sue Trump administration over revised H-1B regs," *HRDIVE*, October 26, 2020, https://www.hrdive.com/news/us-chamber-universities-sue-trump-administration-over-revised-h-1b-regs/587735/
[317] BusinessToday. In, "H-1B visa ban: U.S. business groups sue Trump govt over worker visa rules," July 22, 2020, https://www.businesstoday.in/latest/world/story/h1b-visa-ban-us-business-groups-file-lawsuit-against-trump-government-over-work-visa-freeze-267907-2020-07-22
[318] Thomas J. Donohue, "Why the U.S. Chamber of Commerce Is Suing the Trump Administration: The president's immigration policies are bad for business," *New York Times,* https://www.nytimes.com/2020/07/23/opinion/trump-chamber-of-commerce-lawsuit.html

the policy change threaten American economic interests, but also clearly exceeded the authority of the executive branch as the administration is trying to "destroy the immigration laws that Congress crafted over several generations."[319]

4.4 Stakeholders reported on their adaptability during the COVID-19 pandemic

The restrictions imposed by governments to prevent the spread of the Corona virus forced companies to rethink their workforce model. For STEM sector companies this led to a quick transformation into the "work from anywhere" model,[320] which permitted companies to respond to the emerging needs of clients as more businesses figured out how their employees could work from home. Stakeholders reported varying challenges brought about by the COVID-19 pandemic, including changes to hiring and training practices by companies and academic institutions. While STEM sector companies have benefitted from a decrease in overhead costs and the expanded pool of candidates, as employees could work remotely from a location of their choice (e.g. home), stakeholders have reported on the "growing pains" of these changes. These challenges are likely to continue as the industry "faces a business reckoning" [321] and copes with the wave of layoffs.

As previously mentioned, a significant number of tech companies were able to offer flexibility to their employees by allowing them to work from home. This was branded as a "Success from Anywhere" approach, where companies could give "teams the power to decide how, when and where they work."[322] This allowed for companies to tap into other talent pools and grow in other places where, for example, housing prices are considered relatively affordable. Tech companies like Salesforce and UKG took this

[319] Thomas J. Donohue, "Why the U.S. Chamber of Commerce Is Suing the Trump Administration: The president's immigration policies are bad for business," *New York Times,* July 23, 2020*,* https://www.nytimes.com/2020/07/23/opinion/trump-chamber-of-commerce-lawsuit.html

[320] Prithwiraj (Raj) Choudhury, "Our Work-from-Anywhere Future", *Harvard Business Review*, November – December 2020, https://hbr.org/2020/11/our-work-from-anywhere-future

[321] Washington Post, "Tech layoffs are a warning sign of what's ahead", November 15, 2022, https://www.washingtonpost.com/opinions/2022/11/15/tech-layoffs-warning-sign-economy/

[322] Joe Perin, "How downtown Indy tech companies plan to move forward from the pandemic", *Techpoint*, May 10, 2022, https://techpoint.org/how-downtown-indy-tech-companies-plan-to-move-forward-from-the-pandemic/?utm_source=Twitter&utm_medium=social+media&utm_campaign=DowntownTechWorkforce_May2022

opportunity and expanded in the state of Indiana, which was further supported by organizations like TechPoint, IndyHub and Indy Women in Tech.[323] This move likely reduced the pressure for some companies who relied on foreign talent, as temporary policy changes brought about by the pandemic still required proof of residency, disincentivizing younger researchers abroad from considering a career in the US.[324]

This "Success from Anywhere" approach also brought about changes in hiring and training practices. Since the COVID-19 measures significantly reduced ease in travel, but talent was still in demand, tech companies continued turning to offshore outsourcing to access workers with the required skills abroad. Jimit Arora, a partner at the research firm Everest Group, sees this as a move towards a global talent supply chain that will not be disrupted for the foreseeable future.[325] This has also resulted in changes to training approaches, which have forced companies to rethink the need to fly in employees and instead rely on videocall platforms to facilitate required courses and other onboarding interactions.[326]

Changes in hiring of talent are not unique to tech companies. One of the stakeholders interviewed, who is now in academia, noted that the effects of the pandemic on the economy are being reflected in the contracts available to professors. Universities have jobs open but are not able to offer tenure-track positions that would usually offer more stability. Instead, the academic market has resorted to temporary contracts. This has not gone unnoticed by students, who complain about the turnover of professors.[327] This raises questions about the future of early skills-development and research in STEM.

[323] Joe Perin, "How downtown Indy tech companies plan to move forward from the pandemic", *Techpoint*, May 10, 2022, https://techpoint.org/how-downtown-indy-tech-companies-plan-to-move-forward-from-the-pandemic/?utm_source=Twitter&utm_medium=social+media&utm_campaign=DowntownTechWorkforce_May2022
[324] Stakeholder Interview, Dennis Whyte
[325] Ariel Pardes and Vittoria Elliott, "Tech's Offshore Hiring Has Gone into Overdrive", August 12, 2022, https://www.wired.com/story/techs-offshore-hiring-has-gone-into-overdrive/
[326] Stakeholder Interview, Andres del Castillo
[327] Stakeholder Interview, Laura Abondano

Finally, the industry is now dealing with "tens of thousands of job cuts" [328], which are seen as a consequence of having grown too quickly.[329] In a memo to staff, Meta (Facebook) CEO took responsibility for the uncalculated growth the company undertook, and which resulted in significant layoffs.[330] However, as Amanda Hoover, WIRED Magazine journalist, noted "[d]espite their command of the headlines, Big Tech companies are just one niche in the broader tech industry."[331] The truth is that talent in the tech sector is still in demand and will need to be addressed. According to Goldman Sachs Group Inc, their economists predict that these laid off workers will find work relatively quickly as the American job market remains resilient.[332]

SPOTLIGHT – Canada as a source of talent for the U.S.:

One of the stakeholders interviewed moved to the U.S. from Canada on a O-1 visa, also known as the visa for deemed "extraordinary".[333] While this is an unlikely option for most people, this versatile work permit may be an unconventional path available to Canadians in the tech start-up industry. Alexander Haque discovered he was eligible for this visa through his own network in the industry and Canada. It allowed him to move to the U.S. to explore other options and continue growing.[334] The U.S. presents an attractive option for established Canadian talent that is looking to grow within an innovative community that works with a strong and stable currency.

Canadians also have other options to immigrate to the U.S. Though not as flexible as the O-1 visa, agreements between these neighbours like CUSMA (formerly NAFTA) provide Canadians with avenues

[328] Amanda Hoover, "Despite Big Layoffs, Tech Workers Are Still in Demand", *WIRED,* November 11, 2022, https://www.wired.com/story/despite-big-layoffs-meta-twitter-stripe-tech-workers-are-still-in-demand/
[329] Ayesha Whyte and Dixon Whyte, "Tech layoffs and what the near future might hold for tech workers", *Venture Beat,* November 11, 2022, https://venturebeat.com/business/tech-layoffs-and-what-the-near-future-might-hold-for-tech-workers/
[330] Catherine Thorbecke, "Silicon Valley's Greatest Minds Misread the Pandemic Demand. Now Their Employees Are Paying For It", *CNN,* November 10, 2022, https://www.cnn.com/2022/11/10/tech/tech-layoffs-analysis
[331] Amanda Hoover, "Despite Big Layoffs, Tech Workers Are Still in Demand", *WIRED,* November 11, 2022, https://www.wired.com/story/despite-big-layoffs-meta-twitter-stripe-tech-workers-are-still-in-demand/
[332] Augusta Saraiva, "Big Tech's Layoff Wave Is an Outlier in Still-Robust Job Market", *Bloomberg*, November 15, 2022, https://www.bloomberg.com/news/articles/2022-11-15/big-tech-s-layoff-wave-is-an-outlier-in-still-robust-job-market?leadSource=uverify%20wall
[333] Alexia Fernández Campbell, "The Visa for People Officially Deemed 'Extraordinary'", *The Atlantic, July 27, 2016,* https://www.theatlantic.com/business/archive/2016/07/the-visa-for-people-officially-deemed-extraordinary/493130/
[334] Stakeholder Interview, Alexander Haque

that reduce bureaucratic restrictions. This particular agreement allows for certain professionals (e.g. Computer Systems Analysts and Graphic Designers)[335] in Canada (and Mexico) to apply for work permits. Andy J. Semotiuk, investor immigrations writer for Forbes, noted that the most important aspect of this agreement with respect to immigration is the matter with which permits are expedited,[336] which the sole determinant in a sector that moves as quickly as this one.

[335] NAFSA, "Appendix 2 Professionals", n.d. https://www.nafsa.org/sites/default/files/media/document/appendix2professionals.pdf
[336] Andy J. Semotiuk, "Using The USMCA To Get Work Visas For The USA Or Canada", *Forbes,* October 14, 2022, https://www.forbes.com/sites/andyjsemotiuk/2022/10/14/using-the-usmca-to-get-work-visas-for-the-usa-or-canada/?sh=7d3ca3526d4f

V. Conclusions and Recommendations

The U.S. has a long-standing history of immigration that has been supported by a bureaucratic machine that has evolved over the years and under which users have adapted in an effort to be part of the American Dream.[337] America's immigration system has been molded by a number of factors, such us, prioritizing family reunification. However, due in part to the politized nature of the topic, it has faced hurdles when attempting to respond to the changing needs of the labour market and innovation sector. This was underscored when the COVID-19 pandemic measures were set in place, and it continues to be made obvious under the current economic climate. While stakeholders have managed to work through the system, the U.S. could stand to benefit from modifications to its immigration system that would allow it to become more responsive and agile, and thus better serve the interests of the country.

This research and interviews done for this report identified an express interest from stakeholders for changes to the immigration system, particularly the need to create more certainty. While there are several ideas to overhaul the immigration system, it is clear from various attempts in the past – including the recently passed legislation, the *CHIPS and Science Act* – that if any changes are made, they may need to be incremental. Moreover, any initial change will need to provide early proof of success to demonstrate the need to continue in the endeavour. Based on the semi-structured interviews with high-skilled immigrants and the various pieces published by business associations, there are two main areas of concern that require attention and could be addressed through bureaucratic changes that face minimal political resistance. The first refers to the need for creating measures that ensure certainty and safety for the talent immigrating to the U.S., and the second looks to supporting employers in their growth and human resources planning.

[337] Adam Barone, "What Is the American Dream? Examples and How to Measure It", *Investopedia,* August 1, 2022, https://www.investopedia.com/terms/a/american-dream.asp

1. Creating certainty for talent immigrating to the U.S. to foster competition and innovation:

Stakeholders expressed two main issues with respect to the precarious situation that the system creates for the talent immigrating into the U.S.: 1) challenges finding a job that sponsors temporary and permanent work visas; and 2) inflexible requirements regulating work permits. The current employment-based system provides little agency to economic migrants and reinforces incentives that place migrants under precarious situations. For example, a migrant might take on an underpaid position that does not allow them to live comfortably, because the employer is willing to sponsor their work visa. In doing so, they are attached to one employer and will have issues changings job and negotiating salaries while staying in the U.S. with their current legal status, stifling their career growth and their contribution to the American economy.

While measures like, for example, an open work permit post-graduation would provide the range of agency migrants require, such changes likely require a political will that is too challenging to galvanize without first demonstrating the benefits. However, changes to the bureaucratic system could provide migrants with the certainty they need to plan their career path in the U.S. This could include modifications to visa processing that allow for faster service standards and flexibility to permit facilitative pathways to changing legal status. A better understanding of the bureaucratic process would allow migrants to be fully aware of the options available to them, while shorter processing times would reduce financial worries by allowing them to plan, for example, their time in between employers while waiting for their legal status to change.

2. Supporting employers in planning their growth to secure and strengthen innovation clusters

Business associations have expressed the need to overhaul the system by introducing changes such as removing the annual caps to H-1B visas, eliminating the "per-country" limit, and reducing the employment-based green card backlog by "recapturing" unused visas caused by processing delays from prior fiscal years.[338] These changes would likely also require a political will that does not currently exist. As such,

[338] Business Roundtable, "The state of immigration," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration

similar to the system changes that would provide more certainty for migrants, there are modifications to bureaucratic machine that would better support employers in planning their growth. In addition to faster service standards and clarity in the process, changes that target the innovation sector would greatly benefit both employers and workers.

The Biden Administration has developed an action plan to strengthen international education, including increasing the recruitment and retention of international students, and has made some initial changes such as adding more STEM categories for graduates applying for a temporary visa.[339] It is crucial to track the gains obtained from this change in order to justify further changes such as those suggested by Business Roundtable (i.e. exempt the H-1B visa cap for H-1B workers with degrees in needed fields from U.S. universities and to allow individuals with advanced STEM degrees from U.S. secondary schools to immediately qualify for a green card[340]). Early wins will open the path to changes that are less contentious and more likely to gain bipartisan support.

The fact the U.S. has been able to rely on the reputation of its educational institutions and success of the clusters to attract foreign talent, with little government assistance, highlights the resilience the innovation sector has built over the years. However, as the effects of the COVID-19 pandemic demonstrate their long-term outcomes, the U.S. would benefit from honing particular aspects of its immigration policies to retain the talent brought in by the innovation sector. In doing so, the U.S. would ensure some level of protection to the economy when unexpected systemic shocks take place.

[339] Philip Connor, Andrew Moriarity, Kate Hansen, "Retaining U.S. International Student Graduates to Win the Global Talent Race," FWD.us, February 3, 2022, https://www.fwd.us/wp-content/uploads/2022/02/FWD-International-Student-Report-V6-012822.pdf.
[340] Business Roundtable, "The state of immigration," n.d., https://www.businessroundtable.org/policy-perspectives/immigration/state-of-immigration