

DAY ONE PROJECT

Competitiveness Through Immigration

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Summary

Immigration reform is a national security imperative. A net inflow of science and technology talent is a defining source of strength and key competitive advantage for the United States. Highly skilled science and technology workers provide our nation with an economic edge and drive innovation. However, intensifying competition for skilled workers abroad and self-imposed barriers to immigration at home are deterring potential talent from coming to the United States, instead routing them to competitor countries.

The Biden-Harris Administration should act to attract and retain foreign science and technology talent through a focused overhaul of U.S. immigration laws and procedures. Specifically, the Administration should draw top talent to the United States by streamlining the visa process and providing greater flexibility for foreign scholars and workers. Steps should be taken to ground visa processes in evidence-based procedures, expand visa limits and classes, redesign security-screening procedures to ease bottlenecks, and reallocate resources to build analytic capabilities. Doing so will enhance our national competitiveness, a top government-wide priority. Imminent action is crucial: the suppressed demand for U.S. visa services due to the COVID-19 pandemic has opened a once-in-a-century window to implement reform.

Challenge and Opportunity

An unmatched ability to attract and retain talent from abroad has long been one of the United States' greatest advantages. High-skilled workers are the most critical "raw input" for industries of the future: industries that today include biotech, artificial intelligence (AI), quantum computing, 5G, and more. The recently developed COVID-19 vaccines are a powerful example of foreign-born talent in action. The Hungarian-born scientist Katalin Karikó pioneered mRNA technology, and both Pfizer-BioNTech and Moderna are led by immigrants. Indeed, nearly one-third of America's biotechnology workforce was born outside the United States, including 48% of Ph.D.-holders in the field.¹

The contributions of foreign talent to our nation's broader science, technology, engineering, and mathematics (STEM) ecosystem are equally striking. Half of recent Nobel prizes won by Americans in STEM fields went to immigrants. Immigrants account for 37% of U.S. innovation and hold 24% of U.S.-based STEM patents.² The gap is even wider for the most cutting-edge

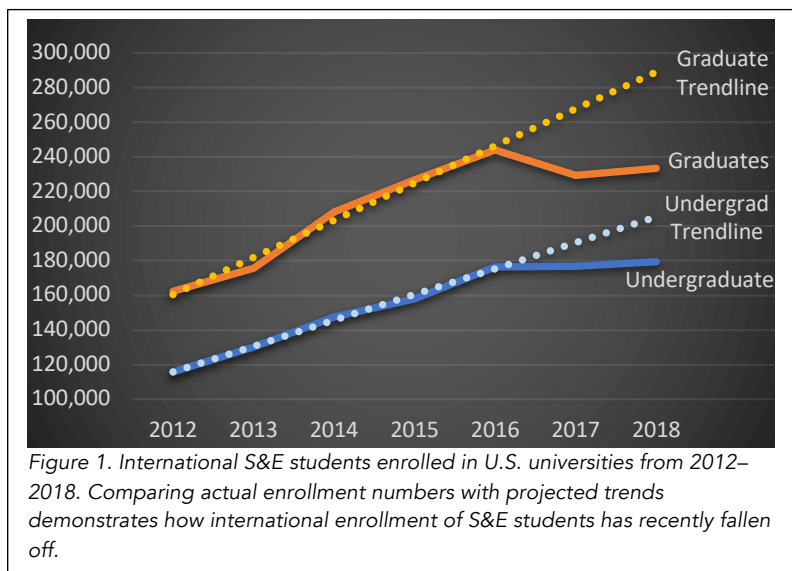
¹ Amy Burke, "Immigration and the S&E Workforce," in *Science and Engineering Labor Force*, National Science Board *National Science and Engineering Indicators*, NSB2019-8, 2019, <https://nces.nsf.gov/pubs/nsb20198/immigration-and-the-s-e-workforce>.

² Innovation was measured based on the number of patents, patent citations, and economic value of those patents. Shai Bernstein, Rebecca Diamond, Timothy McQuade, and Beatriz Pousada, "The contribution of high-skilled immigrants to innovation in the United States," Stanford Business Graduate School, Working Paper 3728, (November 6, 2018): 2,27, https://web.stanford.edu/~diamondr/BDMP_2019_0709.pdf.

technologies. 59% of the world’s top-tier AI researchers are based in the United States and 44% earned their Ph.D. here, even though only 20% of the world’s top-tier AI researchers come from the United States originally.³

However, the United States’ status as the undisputed global leader in science and technology is fast eroding.⁴ In 2019, China surpassed the United States in international patent applications filed with the World Intellectual Property Organization (WIPO). Our nation’s share of global research and development (R&D) investments declined from 34% in 2008 to 29% in 2018, while China’s share rose from 15% to 23% over roughly the same time frame.⁵ A report from the National Security Commission on Artificial Intelligence (NSCAI) found that concerted investments and initiatives have enabled China to leap ahead of the United States in several sub-fields of AI, including facial-recognition and surveillance technologies. The report warns that “China possesses the might, talent, and ambition to surpass the United States as the world’s leader in AI in the next decade if current trends do not change.”⁶

Demand-side trends for higher-education STEM programs in the United States are equally concerning. International students choose to pursue higher education in the United States more than in any other country. Those students enroll in science and engineering (S&E) programs at a disproportionately high rate. However, the U.S. share of the world’s international students is declining, down from 25% in 2000 to 19% in 2014.⁷ International enrollment in S&E higher



education fell 24% below the five-year trend line in 2018 (Figure 1).⁸ The rate at which U.S. S&E doctorate recipients from China and India have stayed and worked in the United States after

³ Meaning that 70% of top-tier AI researchers based in the United States were born elsewhere. Source for Ph.D. data: “Global AI Talent Report,” Jfgagne, accessed March 17, 2021, <https://jfgagne.ai/talent-2019>. Source for country-of-origin and researcher data: “The Global AI Talent Tracker,” Macropolo, accessed March 17, 2021, <https://macropolo.org/digital-projects/the-global-ai-talent-tracker>.

⁴ Andrew Imbrie, Elsa B. Kania, Lorand Laskai, “The Question of Comparative Advantage in Artificial Intelligence: Enduring Strengths and Emerging Challenges for the United States,” *Center for Security and Emerging Technology*, January 2020, <https://cset.georgetown.edu/wp-content/uploads/CSET-The-Question-of-Comparative-Advantage-in-Artificial-Intelligence-1.pdf>.

⁵ “Main Science and Technology Indicators,” OECD, 2021, <http://oe.cd/msti>.

⁶ Eric Schmidt et al., “Final Report,” *National Security Commission on Artificial Intelligence*, March 2021, 7, 161, <https://www.nsc.ai.gov/2021-final-report/>.

⁷ “Science & Engineering Indicators 2018,” NSF National Science Board (2018): 61 & 97, <https://www.nsf.gov/statistics/2018/nsb20181/assets/561/higher-education-in-science-and-engineering.pdf>.

⁸ Data extracted from: Josh Trapani and Katherine Hale, “Higher Education in Science and Engineering,” *Science & Engineering Indicators*, National Science Board, September 4, 2019, <https://nces.nsf.gov/pubs/nsb20197/data>.

degree completion has declined over the last 15 years, from 95% to 83% for Chinese nationals and from 89% to 83% for Indian nationals.⁹ As scholars leave the United States, they take their research experience, education, and institutional knowledge with them. America's historic advantage in recruiting international students and converting them into the science and technology workforce is slowly dissipating.

Our competitors understand the stakes. Chinese President Xi Jinping described talent as “the first resource” in China's pursuit of technological independence.¹⁰ To this end, China has long deployed a comprehensive set of initiatives such as the Thousand Talents Program to recruit foreign nationals and encourage its diaspora to return to China.¹¹ China increased its domestic STEM graduates by 360% between 2000 and 2014, producing 1.7 million domestic STEM graduates in 2014 alone (Figure 2).¹²⁻¹⁴ In a recent speech, President Xi did not mince words about China's plan to recruit foreign talent, stating that China “must assemble first-rate talent with a view to the world, attract foreign high-end talent, and provide internationally competitive and attractive environmental conditions for foreign scientists to work in China.”¹⁵ Xi portrayed the “scientist's spirit” as the driving force behind China's rise while imploring science and technology workers to put national interests first, stating that “Science has no borders, but scientists have motherlands.”

Inefficient immigration policies discourage—and often outright block—the foreign talent that may pioneer the next round of life-saving technology. The Trump Administration exacerbated strain to the immigration system through over 400 executive actions¹⁶ that increased visa denials

⁹ “Foreign-Born Students and Workers in the U.S. Science and Engineering Enterprise,” *Science and Engineering Indicators*, National Science Foundation (2020), <https://nces.nsf.gov/pubs/nsb20197/data>

¹⁰ Remco Zwetsloot and Dahlia Peterson, “The United States-China Technology Wars: China's Immigration Disadvantage,” *The Diplomat* (December 31, 2019), <https://thediplomat.com/2019/12/the-us-china-technology-wars-chinas-immigrationdisadvantage>.

¹¹ These programs range from promoting academic exchanges and opening Confucius Institutes to espionage to building innovation hubs in China. They are part of an even larger web of programs that utilize legal, illegal, and extra-legal methods to facilitate technology transfer. Source: Sean O'Connor, “How Chinese Companies Facilitate Technology Transfer from the United States,” U.S.-China Economic and Security Review Commission, May 06, 2019, 9, <https://www.uscc.gov/research/how-chinese-companies-facilitate-technology-transfer-united-states>

¹² “The Rise of China in Science and Engineering,” *Science and Engineering Indicators*, NSF National Science Board, 2018, <https://www.nsf.gov/nsb/sei/one-pagers/China-2018.pdf>.

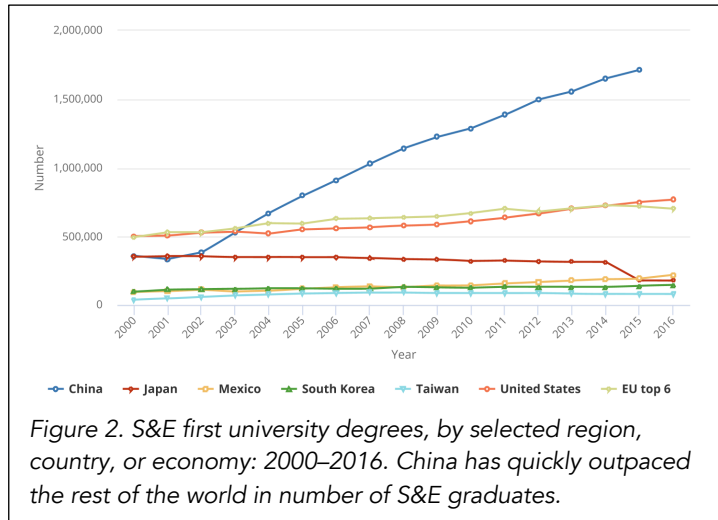
¹³ China has not published more recent figures. The last official estimate was that China produced 4.7 million students in 2015, although they categorize their engineering and science fields more broadly than other nations Source: “UNESCO Reveals Countries Producing the Highest No. of STEM Graduates,” ScooNews, December 3, 2020, <https://www.scoonews.com/news/unesco-reveals-countries-producing-the-highest-no-of-stem-graduates-10394>.

¹⁴ Figure and data from: Josh Trapani and Katherine Hale, “Higher Education in Science and Engineering,” *Science & Engineering Indicators*, National Science Foundation, September 4, 2019, <https://nces.nsf.gov/pubs/nsb20197/data#figure-block>.

¹⁵ Xi Jinping, “Speech on Science and Technology Development,” Trans.: Rogier Creemers, Elsa Kania, Graham Webster, and Rui Zhong, *New America*, September 2020, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/translation-xi-jinpings-sept-2020-speech-science-and-technology/>.

¹⁶ Sarah Pierce, Jessica Bolter, “Dismantling and Reconstructing the U.S. Immigration System: A Catalog of Changes under the Trump Presidency,” *Migration Policy Institute*, July 2020, <https://www.migrationpolicy.org/research/us-immigration-system-changes-trump-presidency>.

and processing times,¹⁷ suspended entry to the United States,¹⁸ and sought to restrain the H-1B program in favor of U.S. workers.¹⁹ But the U.S. immigration system was in disrepair for decades before President Trump took office. Visa-adjudication procedures rely on outmoded methods and systems. Regulations make it difficult for workers to switch jobs or start companies, creating an inefficient distribution of talent capital and fostering potentially abusive power dynamics due to employers' leverage over employees' immigration status. Oppressive security measures implemented to stop technology transfer backfire by creating a chilling effect that drives foreign talent to countries that offer a more stable life and paths to immigration.²⁰ Work-visa caps and restrictions intended to increase U.S. jobs by preventing talented workers from coming to the United States instead result in U.S. jobs being offshored.²¹ America has become complacent in maintaining its status as the most attractive destination in the world for foreign talent.



Changing entrenched systems and practices is a difficult task in any organization. The bureaucratic webs within the interagency administration of immigration operations make reforming the U.S. immigration system especially onerous. However, the COVID-19 pandemic has suspended most routine U.S. visa services while consular sections remain fully staffed, opening a once-in-a-century opportunity to implement new immigration systems and retrain staff with minimal disruption to normal operations.

¹⁷ David Bier, "Visualizing a 4-Year Assault on Legal Immigration: Trends Biden Must Reverse," *Cato Institute*, December 11, 2020, <https://www.cato.org/blog/visualizing-4-year-assault-legal-immigration-trends-biden-must-reverse-0>.

¹⁸ "Suspension of Entry of Immigrants and Nonimmigrants Who Present a Risk to the United States Labor Market During the Economic Recovery Following the 2019 Novel Coronavirus Outbreak," *Proclamation 10052 of June 22, 2020*, Executive Office of the President, June 22, 2020, <https://www.federalregister.gov/documents/2020/06/25/2020-13888/suspension-of-entry-of-immigrants-and-nonimmigrants-who-present-a-risk-to-the-united-states-labor>.

¹⁹ The Trump Administration sought to mandate higher wages and narrow the definition of "specialty occupations", which some saw as weakening the H-1B program. While those changes would limit the types of positions available and make it harder to fill entry-level positions, it would not have changed the size of the H-1B program given how much visa demand exceeds visa supply. Sources: (i) "Strengthening the H-1B Nonimmigrant Visa Classification Program," Department of Homeland Security, October 08, 2020, <https://www.federalregister.gov/documents/2020/10/08/2020-22347/strengthening-the-h-1b-nonimmigrant-visa-classification-program>, and (ii) "Strengthening Wage Protections for the Temporary and Permanent Employment of Certain Aliens in the United States," Employment and Training Administration, October 08, 2020, <https://www.federalregister.gov/documents/2020/10/08/2020-22132/strengthening-wage-protections-for-the-temporary-and-permanent-employment-of-certain-aliens-in-the>.

²⁰ Tina Huang and Zachary Arnold, "Immigration Policy and the Global Competition for AI Talent," *Center for Security and Emerging Technology*, 2020, <https://cset.georgetown.edu/research/immigration-policy-and-the-global-competition-for-ai-talent>.

²¹ Glennon found that for every unfilled H-1B position, at least 0.3 foreign jobs were created. Source: Britta Glennon, "How Do Restrictions on High-Skilled Immigration Affect Offshoring? Evidence from the H-1B Program," *National Bureau of Economic Research*, Working Paper 27538, 2020, https://www.nber.org/system/files/working_papers/w27538/w27538.pdf.

An ongoing push for immigration reform is presently stalled over partisan politics. This proposal distinguishes itself from proposals for immigration reform that have faltered by focusing more acutely on immigration reform vis-à-vis national competitiveness. It aligns with an awakening across federal government for the need to strengthen America's competitiveness. The imminent Endless Frontier Act and NSCAI's final report also address the topic of national competitiveness and provide complementary recommendations to this proposal.

Plan of Action

To ensure America's competitiveness in science and technology, it is imperative to deploy an integrated strategy aimed at expanding the talent pipeline from abroad and encouraging foreign nationals with S&E expertise to stay in the United States. These goals can be accomplished by reducing friction along the immigration pathway, including by making work and student visa programs more accessible and updating visa procedures and technology-transfer screens to be less disruptive and more effective.

To start, **President Biden should issue an Executive Order establishing a Competitiveness Through Immigration Commission (CTIC)**. CTIC will be tasked with investigating immigration policies' effects on national competitiveness, providing evidence-based policy recommendations, and tracking the implementation of immigration reform in the U.S. Department of State (State) and Department of Homeland Security (DHS). CTIC will facilitate a comprehensive examination of U.S. immigration policies and their externalities and investigate how those policies compare to immigration policies in other countries. CTIC will also propose updates to the Immigration and Nationality Act (INA) to Congress. CTIC should be housed within the White House Office of Science and Technology Policy (OSTP). It should be co-chaired by the Director of U.S. Citizenship and Immigration Services and the State Assistant Secretary of State for Consular Affairs, with other federal stakeholders²² appointing commissioners. CTIC should employ a full-time staff, including a five-member research and data-science team and two coordinators to liaise across agencies.

The following additional actions could be implemented by Congress and/or federal agencies without or in conjunction with CTIC. These actions are grouped into three categories: (1) reforming work and student visas, (2) reforming visa processing, and (3) safeguarding against technology transfer.

²² Including at least the Departments of Commerce, Education, Labor, and Justice as well as the U.S. Customs and Border Patrol (CBP) and U.S. Immigration and Customs Enforcement (ICE).

(1) Reforming Work and Student Visas

A balanced approach operating via multiple avenues is required to attract top science and technology talent to—and retain that talent in—the United States. The two biggest opportunities for improvement are in student visas and high-skilled worker visas.

Work visas

Expanding the temporary work-visa (especially H-1B visa) program will allow U.S. employers to fill science and technology jobs and expand U.S. R&D capabilities. The proposed U.S. Citizenship Act of 2021 (hereafter U.S. Citizenship Act) incorporates several welcomed changes to immigrant work visas (see the FAQ section for a brief discussion). This proposal brings attention to the underserved topic of non-immigrant visas. Foreign talent is crucial to the U.S. innovation ecosystem and contributes substantially to the U.S. economy.²³ Yet the annual numeric limit (cap) of H-1B (specialty occupation) temporary work visas was reduced from 195,000 to 85,000 in 2004²⁴ and has remained at this level even as domestic tech companies' demand for foreign talent has increased. In FY 2021, only 31% of 275,000 H-1B petitions were selected.²⁵ U.S. immigration policy pushed the remaining 185,000 qualified and willing workers to employ their skills in competitor countries. Moreover, burdensome regulations and costs discourage all but the largest employers from sponsoring work visas. There is no reasonable pathway for granting non-immigrant visas to talented individuals seeking to become entrepreneurs.²⁶

Making non-immigrant visas more flexible will allow market forces to more effectively allocate human capital. The following steps should be taken to reform work visas.

²³ H-1B workers alone account for an annual \$174 billion in spending. Their contribution breaks down to \$85 billion dollars in taxes, \$76.7 billion in spending at U.S. businesses, and more than \$12 billion invested into U.S. businesses every year. Source: Frank Gogol, "The True Economic Impact of H1B Visa Holders," Stilt (June 2020), <https://www.stilt.com/blog/2020/06/the-true-economic-impact-of-h1b-visa-holders>.

²⁴ A provision increasing the cap wasn't renewed, so the cap reverted to its original 1990 level plus 20,000 extra slots for applicants with graduate degrees. Source: "The Timeline of the H-1B Cap" SGM Law Group (n.d.), accessed April 2020, <https://www.immi-usa.com/h1b-visa/h-1b-cap/>.

²⁵ USCIS received 275,000 petitions for FY 2021, with 46% of the beneficiaries holding advanced degrees from U.S. institutions. Source: "USCIS Receives 275,000 FY 2021 H-1B Cap Registrations, Petition Filing Period Begins," Fragomen, April 1, 2020, <https://www.fragomen.com/insights/alerts/uscis-receives-275000-fy-2021-h-1b-cap-registrations-petition-filing-period-begins>.

²⁶ The only visa class available for would-be entrepreneurs is the EB-5 "investment visa," an immigrant visa requiring an investment of \$1.8 million.

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- Congress should pass an immigration reform bill into the Immigration and Nationality Act (INA)²⁷ to:
 - Grant an additional 50,000 H-1B petitions annually for positions requiring skill in critical science and technology areas, as determined by CTIC and the NSC.²⁸ These additional petitions would not count against the existing H-1B cap.²⁹
 - Allow USCIS to link the H-1B cap to employment levels and previous years' demand.
 - Introduce a new class of "founder" visas designed for startups and entrepreneurs. These visas should be initially valid for three years and should be indefinitely renewable in three-year increments. If, at the time of renewal, the startup is stable and employs 10+ Americans with competitive wages (as determined by USCIS), the visa holder should automatically be eligible to apply for Legal Permanent Resident (LPR; i.e., "green card") status. These "founder" visas could be adapted from the models of startup visas available in Australia³⁰ and Canada.³¹
- USCIS and the Department of State's Bureau of Consular Affairs (CA) should use their existing regulatory authorities to update the Federal Register with rules expanding work eligibility for top S&T talent. Specifically, these agencies should:
 - Expand open-market eligibility for work permits. Allowing foreign talent to directly apply for work authorization instead of relying on a sponsoring company will enable the labor market to optimize talent distribution and give talent the freedom to pursue entrepreneurial ventures. The mechanism for open-market work permits is already in place. DHS published a final rule in 2016 that allows foreigners with "compelling circumstances" on temporary work visas to obtain open-market work permits for a one-year renewable period. USCIS should clarify and expand these criteria to include an elite cohort of graduating S&T students and professionals.³²
 - Replace the H-1B lottery. USCIS currently uses a lottery system to randomly select visa petitions to grant. Under the Trump Administration in January 2021, USCIS

²⁷ This proposed bill follows in the spirit of the American Competitiveness in the 21st Century Act (AC21), which was signed into law in 2000 and increased the H-1B cap to 195,000 for fiscal years 2001–2003. The Immigration and Nationality Act of 1952 codified U.S. immigration law under one text and remains the authoritative body of U.S. immigration law.

²⁸ What is critical will fluctuate over time, which is why CTIC and NSC should designate a new list every two years. A current list of candidates should at least include AI, quantum computing, cryptography, and advanced semiconductor fabrication.

²⁹ The proposed U.S. Citizenship Act has a provision to exempt foreign doctoral students who graduate from U.S. universities in STEM fields from the cap on *immigrant* visas. This exemption should be extended to H-1B visas.

³⁰ "Entrepreneur stream," Australian Government Department of Home Affairs (2021),

<https://immi.homeaffairs.gov.au/visas/getting-a-visa/visa-listing/business-innovation-and-investment-188/entrepreneur-stream>.

³¹ "Immigrate with a start-up visa: About the process," Government of Canada (2020), <https://www.canada.ca/en/immigration-refugees-citizenship/services/immigrate-canada/start-visa/about.html>.

³² This follows a recommendation from the NSCAI's 2021 Final Report: Eric Schmidt et al., "Final Report," *National Security Commission on Artificial Intelligence*, Mar. 2021, 428, <https://www.nscai.gov/2021-final-report/>.

published a final rule to amend its selection regulations by prioritizing positions with higher salaries.³³ The Biden Administration includes similar provisions in the proposed U.S. Citizenship Act. However, talent and need only loosely correlate to pay. USCIS should amend its final rule so that selection criteria are based on a weighted score factoring in the wage offered for a position, the skill level of the position, how difficult the position is to fill, and whether the position is in a critical industry. Replacing the H-1B lottery with a more strategic selection process will prioritize admission of the most crucial portion of the potential foreign talent pool.

- Expand eligibility for O-1A visas to include Ph.D. graduates in critical science and technology fields. O visas are designated for “individuals with ‘extraordinary ability’ in the sciences, education, business, or athletics.” USCIS and CA should alter the eligibility criteria for O visas by including holders of Ph.D.s in critical fields as part of the pool of individuals with “extraordinary ability.”³⁴ Unlike H-1B visas, O-1A visas do not have numeric limits nor do they only take effect in October. Hence expanding eligibility criteria for O visas will provide a path to work authorization for the best-educated foreign talent in critical science and technology fields.

Study and exchange visas

Study and exchange visas—specifically F-1 and J-1 visas³⁵ and Optional Practical Training (OPT) extensions³⁶—provide the pathway into the U.S. workforce for a large portion of talented foreigners in science and technology. In 2019, these programs brought more than a million international students to study in the United States, of which about 25% directly contributed to

³³ The rule would first select the petitions with the highest Occupational Employment Statistics (OES) prevailing wage level the proffered wage equals. See: “Modification of Registration Requirement for Petitioners Seeking To File Cap-Subject H-1B Petitions,” Department of Homeland Security (Jan. 08, 2021), <https://www.federalregister.gov/documents/2021/01/08/2021-00183/modification-of-registration-requirement-for-petitioners-seeking-to-file-cap-subject-h-1b-petitions>.

³⁴ Under INA §1101 (a)(15)(O)(i), O-1A eligibility applies to an alien who “has extraordinary ability in the sciences, arts, education, business, or athletics which has been demonstrated by sustained national or international acclaim... and whose achievements have been recognized in the field through extensive documentation, and seeks to enter the United States to continue work in the area of extraordinary ability.” This definition gives USCIS and State the latitude to stipulate that a Ph.D. in a critical field meets the criteria for “extraordinary.”

³⁵ F-1 visas are academic student visas—the largest category of study and exchange visas. J-1 visas are cultural-exchange visas that include the Summer Work Program, student exchange, and research programs and are another important pathway for introducing talent to the U.S. S&T ecosystem. J-1 visas are explicitly designed for exchange programs, often based on reciprocity. Direct attempts to capture exchange scholars would violate the intent and spirit of this visa class. However, ties made during an exchange may prompt foreign talent to later join the U.S. workforce via a different mechanism. M-1 visas, for vocational studies such as pilot training, also exist but are not directly salient to this memo.

³⁶ The OPT program allows foreign students to obtain temporary employment related to their area of study while on an F-1 visa. This may be achieved during their studies or in the year following completion of their studies. An optional 24-month extension is available for students who received a STEM degree. The OPT program is attractive to students because it is a simpler and cheaper method of securing work authorization than designated work visas and is uncapped. The program is attractive to employers because it does not require sponsorship (although there are reporting requirements). See: “Optional Practical Training (OPT) for F-1 Students,” USCIS. (2021), <https://www.uscis.gov/working-in-the-united-states/students-and-exchange-visitors/optional-practical-training-opt-for-f-1-students>.

the economy via the OPT program.³⁷ International graduate students in particular are a boon to United States competitiveness. For instance, 29% of the world's top-tier AI researchers received undergraduate degrees in China. Of those, 54% went on to earn graduate degrees in the United States...the vast majority of whom stayed on to join the U.S. workforce.³⁸ The pipeline of skilled foreign science and technology scholars should be expanded and directed towards the U.S. workforce by codifying natural transitions to work visas, cutting red tape, and making the visa adjudication process more objective. Specifically:

- Congress should amend the INA to allow F-1 visa holders to automatically convert STEM OPT extensions into work visas. This action would make transitioning into the workforce the default option for talented STEM graduates, greatly increasing our nation's retention of top S&T talent. Since F-1 visa holders pursuing STEM OPT extensions have studied and worked in the United States for multiple years, these individuals have already undergone a *de facto* screening for skills and cultural fit.
- The Student and Exchange Visitor Program (SEVP) should set up a transparent database and tracking system to consolidate records from academic institutions, DHS, and State. This system would give immigration authorities more evidence to base decisions on and will help monitor foreign students for technology transfer threats and delinquencies.³⁹
- Implicit decisions based on the socioeconomic backgrounds of students should be explicitly forbidden in the visa-adjudication process. U.S. Visa Officers often base adjudications in large part on the socioeconomic background of the applicants.⁴⁰ This approach not only puts less-wealthy students at a procedural disadvantage,⁴¹ it is also ineffective at selecting for top talent. Consular Affairs (CA) should amend visa-adjudication practices to emphasize metrics that objectively assess applicant fit and skills. Specifically:

³⁷ "2019 Open Doors Report on International Educational Exchange," *Open Doors® Data Portal*, U.S. Department of State (2019), accessed March 17, 2021, <https://opendoorsdata.org/data/international-students>.

³⁸ "The Global AI Talent Tracker," Macro Polo (n.d.), accessed March 17, 2021, <https://macropolo.org/digital-projects/the-global-ai-talent-tracker>.

³⁹ As this proposal generally seeks to make it *easier* for foreign students to come to the U.S., it is even more important to utilize low cost measures that seamlessly increase security while putting a low burden on to the process' stakeholders.

⁴⁰ The (not unreasonable) logic being that applicants with higher socioeconomic status are less likely to be economic migrants. Consular Officers make the majority of their refusals on the basis of INA 214(b) (the "intending immigrant" clause), which requires visa applicants to "establish to the satisfaction of the consular officer" that they are entitled to nonimmigrant status. State's regulations concerning INA 214(b) can be found at <https://fam.state.gov/fam/09FAM/09FAM030201.html>.

⁴¹ The practice, although ineffective and inequitable, stems from political pressure to prevent illegal immigration as well as from the lack of alternative tools that Visa Officers have available to make decisions. For instance, a common practice is to use area code as a proxy for socioeconomic status—increasing the burden of proof for students who are "born on the wrong side of the tracks." Although there are broad correlations between place of residence and visa misuse, geographic profiling is very imprecise.

- Congress should maintain the provision in the U.S. Citizenship Act (Sec. 3408) to extend the “dual intent”⁴² provision to students on F-1 visas at institutions of higher education. This provision, if enacted, will remove the residency requirement, a primary justification of ineligibilities based on socioeconomic status.
- CA should tie visa-adjudication procedures for students on F-1 visas directly to those students’ academic potential, study plans, and academic intent. CA should provide Visa Officers with decision-making tools to evaluate candidates their merits as legitimate students. Records from previous academic institutions ought to be collected as a matter of course to facilitate meaningful evaluations.
- Permit blanket work authorization for students to work part-time while studying in the United States. To ward against abuse, students should be required to maintain a 3.0 GPA and report their employment to the SEVP. This change will give students access to resources to support their education, allowing more top-performing students of limited socioeconomic means to study in the United States.

(2) Reforming Visa Processing

Evidence-based decision making should be adapted in visa policies and procedures. Current immigration policy relies primarily on the subjective judgment and ideology of leaders at the White House, DHS, and State. Individual visa decisions are contingent on the perception a Visa Officer forms of a candidate from a slim application and a face-to-face interview lasting only 1–2 minutes. It is essential that agencies with authority over visa processing move towards objective decision-making by building analytical capabilities, cultivating knowledge-management structures, and institutionalizing new standards based on improved evidence.

An evidenced-based approach starts with good data. To this end, **immigration agencies should define and track important user metrics and build a shared, detailed database.** The database should be constructed with split access. Access to complete data should be limited for individual immigration adjudications. Access to deidentified data should be granted more widely and utilized by immigration agencies to make more detailed analyses. CTIC’s dedicated analytics team should directly interface with CA’s Visa Services Directorate (CAVO)⁴³ and USCIS to study and analyze important metrics and externalities of the visa process, including:

⁴² “Dual intent” refers to the provision in INA that allows some classes of nonimmigrant visa holders (such as H-1B holders) to take steps towards becoming lawful permanent residents while still maintaining their current nonimmigrant visas. Intent to immigrate is otherwise a violation of INA 214(b).

⁴³ “CA’s Visa Services Directorate (CAVO) supports the processing of all U.S. visa applications, advises posts on visa matters, and liaises with the Department of Homeland Security and other government and nongovernment entities interested in visas and immigration.” Source: “Inspection of the Bureau of Consular Affairs, Visa Services Directorate,” *U.S. Department of State and*

- Quantified results of visa decisions. This will include a detailed breakdown of violations by visa recipients as well as a review of unjustified visa denials.⁴⁴ A review of unjustified denials should take the form of an objective study performed by a neutral group of immigration experts on randomly selected visa applicants that were denied visas. It should determine the percentage of visa denials for applicants who: (1) clearly qualified for a visa based on the facts of the situation; and (2) clearly qualified based on what was presented to the Visa Officer.⁴⁵
- Efficiency of various visa-adjudication techniques, visa units, and Visa Officers. Little scrutiny is given to Visa Officers' decisions and methods besides their speed of adjudication and rate of refusal. Exploring how data such as the adjudicating officer's notes, documents used and factors considered in the decision-making process, and interview length correlate with rates of approval and rates of visa abuse will provide real-world evidence into adjudication best practices. Visa units should be encouraged to experiment with new techniques to build useful data. Tracking metrics related to outcomes and the decision processes will emphasize to visa units that decision quality is at least as important as decision quantity.⁴⁶
- Average delays caused by administrative processing. Consulting systems analytics about delays incurred at each step will help to identify and eliminate bottlenecks.
- Cost-benefit analyses of immigration policies. Such analyses will aid in adjusting risk thresholds for visa adjudications and admittance rates. Inputs into these analyses include:
 - Costs of immigration to the United States. Costs include the costs of U.S. services rendered to visa violators by immigration agencies, law enforcement, and other agencies, the social costs of displaced jobs, and economic damage inflicted by technology transfer associated with foreign nationals in the United States.

Broadcasting Board of Governors, Office of Inspector General (2014), https://www.stateoig.gov/system/files/isp-i-15-01ca_visa_services_directorate.pdf.

⁴⁴ Whether visa denials were "correct" involve a counterfactual, viz.: "if the visa had been granted, would the applicant have traveled for intended purpose and obeyed immigration laws," and thus are impossible to verify. However, whether visa decisions are *justified* can be better quantified, albeit not perfectly.

⁴⁵ If the results find that a disproportion number of denials are (1) but not (2), it indicates the existence of systemic failures in introducing available pertinent information to the Visa Officer. Whereas if both (1) and (2) are found, then either Visa Officers are making judgement errors and/or their visa unit is enforcing standards that do not conform with the law.

⁴⁶ The effects of observation bias mean that the more closely these indicators are tracked, the greater weight the Visa Officers will put on them. Efforts should be made to improve decision quality. However, more data is needed to determine how "quality" is measured, besides higher approval and lower rates of visa abuse per given population.

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- Value added to the U.S. economy by visa users. Value can come from business deals, productive output, job creation, tuition, tourism revenue, conferences, innovation, and more.
- Estimates of the economic impact of visa denials and delays, as measured by the opportunity cost to above categories.

This improved data and analysis will ultimately drive immigration-policy reform. But the Administration need not wait to improve visa processing. The following steps towards this goal can and should be taken immediately:

- Increase the flexibility of visa regulations. There will always be special circumstances and individual cases that are not imagined when regulations and policy are drafted. Failure to allow medical workers and researchers to enter the United States during the COVID-19 pandemic is a stark reminder of this reality.⁴⁷ To this end, Visa Officers should be given more discretion to adjudicate admission decisions under special or urgent circumstances. CA should create a dedicated process for issuing lawful visas under special or urgent circumstances. Special adjudications will be subject to simultaneous clearance by CAVO and will be monitored to prevent misuse. Creating a dedicated emergency process for visa processing will decrease delays and the need to create a new administrative process for each unique emergency case.
- U.S. Consular Affairs should create a mechanism to allow work and student visa holders to renew their visas while in the United States.⁴⁸ Current practice requires visa holders to renew their visa at embassies or consulates outside the United States. This requirement is unduly disruptive and substantial visa-processing times make it onerously so. Allowing visas to be renewed in the United States will make it possible for visa holders to continue to work and study in the United States as their cases are being processed.
- Update visa-adjudication methods. Adjudications are currently made using 19th-century techniques on 20th-century computer systems. Decisions rely primarily on the interviewing Visa Officer's instinct, as determined by a 1–2 minute face-to-face interview with each candidate and the limited information the candidate volunteers on their visa application. The U.S. government should move to make in-person interviews for visa applications the

⁴⁷ Presidential Proclamation 10052 (Suspension of Entry as Immigrants and Nonimmigrants of Persons Who Pose a Risk of Transmitting 2019 Novel Coronavirus) in January 2020 started barring entry from countries determined to be a risk for transmitting COVID-19. Although the proclamation included exemptions, it did not include a clear process by which to apply these exemptions. As a result, CA released interim guidance discouraging such exemptions. Doctors and researchers going to the United States to assist with COVID-19 mitigation were effectively stalled until past July 2020, when a clear process was finally implemented.

⁴⁸ Thanks to Christopher Richardson for this suggestion. See: Christopher Richardson, "Biden can help rebuild America's greatness by letting more international students study and stay in the US," *Business Insider*, February 20, 2021, <https://www.businessinsider.com/student-visa-policy-america-immigration-international-biden-administration-2021-2>.

exception rather than the rule. Paper-based (electronic) adjudications, which the rest of the world has adopted to great effect, should be utilized instead. Paper-based adjudications are more cost-efficient, as they require less of the Visa Officer's time and reduce the logistical, infrastructural, and security costs of hosting applicants. They are also more effective, because they utilize more information in the decision process and maintain objectivity better than the pageantry of in-person interviews.⁴⁹ As in-person interviews are currently required by law (8 U.S. Code § 1202 (h)),⁵⁰ implementing this change will require Congress to pass legislation updating the INA.

- Locally Employed Staff (LES) in visa units should be empowered to help analyze visa applications for non-security issues. LES are native speakers who have greater cultural knowledge of their own country than U.S. Visa Officers, who normally serve 2-year consular tours. LES generally have longer careers in visa units, allowing them to acquire greater institutional knowledge. Yet regulations and a culture of distrust have largely regulated LES to merely administrative tasks. Utilizing LES in visa-decision processes will improve adjudication accuracy and free Visa Officers to spend more time on higher-priority tasks requiring cleared U.S. officials. The INA (8 U.S. Code § 1202 (h)) requires that a Visa Officer "review and adjudicate" visa applications but does not preclude LES from making recommendations. In the short-term, CA/VO should update their regulations to allow LES to do so. Moving forward, Congress should formalize this policy by replacing the aforementioned INA clause with a clause stating that "visa applications shall be reviewed or adjudicated by a consular officer."
- Update systems and software for visa processes. Current systems are outmoded, leading to lost productivity, wasted employee time, and frequent outages. Efforts by the Office of Consular Systems and Technology (CST) to modernize consular operations and combine State's 92 legacy consular applications into a single "ConsularOne" application have been ongoing since 2009 yet still aren't complete.⁵¹ It is time to accelerate the process by shifting responsibility to CA's executive office.
 - CA's Visa Services Directorate (CA/VO) should work with CST and State's newly formed Center for Analytics (CfA) to employ a team of expert data scientists to use regression analysis and machine learning to construct predictive models of visa users that can assist in adjudication. These models will incorporate the massive quantity of information available in consular systems to find patterns and produce

⁴⁹ See FAQ section for more information.

⁵⁰ For all visa applicants over 14, excluding some renewals. See: "8 U.S. Code § 1202 - Application for visas," Legal Information Institute, Cornell Law School, <https://www.law.cornell.edu/uscode/text/8/1202>.

⁵¹ "Inspection of the Bureau of Consular Affairs, Office of Consular Systems and Technology," *U.S. Department of State and Broadcasting Board of Governors, Office of Inspector General* (2016): 7, https://www.stateoig.gov/system/files/isp-i-17-04_-_ca-cst.pdf.

the likelihood of given outcomes such as overstays, fraudulent information, and security risks. Machine-learning systems work best when trained on massive datasets, which is why these algorithms are heavily deployed in the finance and insurance sectors.⁵² The rich information that consular systems already routinely collect is an opportune use case for deploying machine-learning systems.

- CA should amend the Consular Electronic Application Center (CEAC) visa-application form to require that the names of local entities be listed in both the native language and English. The current system requires that the form be filled in English only. Confusion results when there are multiple translations names, the names are phonetically Romanized in different ways, or the English name is unknown. The outcome is inconsistent data collection and mismatching names, which in turn create security gaps. Simply requiring that names be written in the native language will reduce these errors and improve data.
- CA should require applicants to list parent organizations of companies and affiliates in the CEAC. Complex corporate structures often disguise affiliations to sensitive entities, which creates security vulnerabilities. Requiring applicants to provide this information will help close the information gap causing these vulnerabilities.
- CA should systematically obtain end-user feedback for the design and improvement of its systems. The collection and incorporation of user input is a critical component of most design methodologies (including the Stage-gate method and Agile Development). Yet this practice does not currently happen at State.⁵³
- CA should redesign pre-interview appointment processes to require accessing just one, State-managed website. Applicants must currently navigate four to five websites just to book an appointment.⁵⁴ Appointment systems are managed by contractors, which limits the ability of visa units to resolve issues arising in the processes. Consolidating this process under State control will allow CA to create a process that works for its customers.

⁵² Chi Chan et al., "Artificial Intelligence Applications in Financial Services," Hermes Investment Management; Marsh, Oliver Wyman; Bryan Cave Leighton Paisner LLP, 2019, <https://www.marsh.com/content/dam/marsh/Documents/PDF/UK-en/artificial-intelligence-applications-in-financial-services.pdf>.

⁵³ "CCD: Report Says Visa Processing Systems Pose Significant Challenges; Also Face User-Friendlessness?" Diplopundit, November 4, 2015, <https://diplopundit.net/tag/ccd-crash/>.

⁵⁴ In the author's personal experience giving public talks about the visa-application process, about half of the audiences' questions were about how to navigate the clunky appointment systems. Christopher Richardson also provided this suggestion.

(3) Safeguarding Against Technology Transfer

Security measures designed to prevent technology transfer need to be reformed to work for, not against, America's interest. Smarter and more efficient means of screening applicants for tech-transfer concerns are needed. Existing measures to prevent tech transfer are ineffective, and their negative externalities far outweigh the harm they were designed to prevent.

Restrictions and policies that were implemented to stop tech transfer instead create a chilling effect that discourages S&T talent from coming to the United States. Security checks that add an additional 1–3 months of visa-processing time for a majority of foreign talent in S&T result in foreign students missing entire semesters, workers missing projects, and speakers missing conferences. Thousands of applicants each year end up waiting more than six months for their security checks to clear. Even worse, these policies backfire in their intended purpose of preventing tech transfer. When U.S.-based talent is stuck abroad waiting for visa clearance, openings are created for other countries to recruit them. With talent unable to come to them, U.S. tech companies increasingly move research and development operations to competitor nations where the talent resides—and where the price of operating is often forced tech transfer.⁵⁵

Existing measures to screen for tech-transfer concerns are primarily based on the information applicants disclose, making them effective at discovering disclosed ties but not the undisclosed ties to foreign governments that are most important with respect to potential espionage. Instead of deploying measures to prevent honest foreign nationals from entering, U.S. government agencies should adopt targeted and precise security measures to prevent tech transfer instead of blunt, disruptive instruments that impede U.S. competitiveness. The following measures should be enacted to reform tech-transfer screenings:

- State should deploy expert machine-learning systems to automate visa-screening processes for tech-transfer concerns. These systems will integrate robust libraries, foreign-language names and technological terms, and patterns derived from vast droves of interagency data to provide more precise judgements than can come from the non-specialized officials who currently perform tech-transfer security checks. CAVO should work with the State CfA to design and implement such systems. This improvement could be implemented in about a year with a budget of only \$6 million.⁵⁶
- The root cause of security-check delays are indiscriminate security check requests that overburden the interagency team in charge of clearing them. Visa Officers must make

⁵⁵ Remco Zwetsloot, James Dunham, Zachary Arnold, Tina Huang, "Keeping Top AI Talent in the United States," *Center for Security and Emerging Technology*, December 2019, <https://cset.georgetown.edu/wp-content/uploads/Keeping-Top-AI-Talent-in-the-United-States.pdf>.

⁵⁶ State invested about \$1 million in the "SAO Improvement Project" (SAO IP) in 2003 to upgrade its Consular Consolidated Database (CCD) to allow electronic processing and tracking of all security requests and to eliminate use of its traditional cabling system. The estimated price tag provided here is based on this \$1 million price tag, adjusted by a CPI inflation of 46% during the intervening period and multiplied by a factor of four to account for the increased complexity of data systems and demands of machine-learning tools. Source: "Boder [sic] Security: Streamlined Visas Mantis Program Has Lowered Burden on Foreign Science Students and Scholars, but Further Refinements Needed," GAO-05-198, U.S. Government Accountability Office (2004), <https://www.gao.gov/content/pkg/GAOREPORTS-GAO-05-198/html/GAOREPORTS-GAO-05-198.htm>.

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split-second decisions about technology issues that could be vital to national security. As Visa Officers have no disincentive against requesting superfluous security checks yet are legally liable for missing potential security threats and professionally liable for their adjudication speed, they err on the side of over-submitting security checks. This creates a moral hazard where applicants and the security team bear the cost of overzealous upfront screening. To change this:

- CA should alter the incentive structures so that both missed screens and inappropriate screens are evaluated in a Visa Officer's performance. Officers should be given better training and more time per case to compensate.
- Criteria for security screens should be tightened. The tech-transfer security apparatus should build a "small yard with a tall fence." A joint working group led by CAVO and the Department of Commerce's Bureau of Industry and Security (BIS) should establish a taxonomy of tech-transfer priorities that limits screens to known threats, direct ties to adversaries' industrial-military complexes, and national security threats. Dual-use technologies should be monitored, not restricted, unless there is a direct nexus to the Entity List.⁵⁷
- CA and USCIS should create an official portal where entities sponsoring foreign workers and scholars verify applicants. Universities, conferences, NGOs, agencies, and companies sponsoring foreign nationals would be required to provide information including syllabi, conference agendas, and job duties through the portal. Adjudications of non-petitioned applicants are currently based solely on the materials that applicants themselves provide. Utilizing information from a third party will help verify applicants' assertions and will guard against tech transfer.⁵⁸

In addition, policymakers must have a holistic understanding of our adversaries' tech-transfer toolsets. Most tech transfer occurs through mechanisms unrelated to immigration, including foreign direct investment (FDI) in U.S. companies, venture capital (VC) investments targeting U.S. startups, companies entering into joint ventures (JVs) to operate in foreign countries, licensing agreements exposing U.S. companies' intellectual property (IP), cyber espionage, foreign investments, and talent-acquisition programs targeting domain experts in the United States. Three crucial steps the U.S. government can take to stem the threat of tech transfer are:

- Leveraging the power of the private sector and NGOs to multiply efforts against tech transfer. The U.S. government should strengthen bidirectional information sharing with NGOs, companies, and universities. In particular:

⁵⁷ [The Entity List](#) is a list of entities for which there is reasonable cause to believe are engaged in activities contrary to national security, including tech transfer. These entities are subject to specific licensing requirements for exporting and transporting certain items. The Entity List is found in the Export Administration Regulations (EAR), which is maintained by BIS.

⁵⁸ A formalized system such as this would also help in detecting fraud patterns.

- The government should be more transparent about tech-transfer risks, thereby making it easier for entities affected by tech-transfer vulnerabilities to contribute to mitigation efforts. A review of government-owned data related to tech transfer should be conducted. Non-sensitive data should be consolidated into publicly available databases.
- The government should establish a reporting system for U.S. entities with affairs abroad to increase the capacities of federal agencies to monitor tech-transfer activities. Such activities include talent-recruitment programs, forced acquisitions and joint ventures, and other anti-competitive behaviors. The U.S. government needs the ability to review all foreign investments and business arrangements that carry tech-transfer risks. It should strengthen reporting requirements for foreign investments and divestments by widening the CFIUS review process, closing loopholes, and implementing an automated process that reduces reporting burdens. The government should also collaborate with research institutions, journalists, and universities to collect and analyze open-source data related to tech transfer. It should abet tech-transfer researchers by providing stable access to relevant information, including archives of websites and translations.
- Creating global mechanisms for IP governance, joint-venture requirements, and foreign-investment regulations. The U.S. government should capitalize on its partnerships and allies by leading a coalition of countries affected by tech transfer. This coalition will share intelligence and develop mechanisms for a collective response to tech-transfer threats. It should implement policies that disincentivize entities from accepting or demanding illicit requests for IP transfer and foreign investments in exchange for market access and capital. Enforcement mechanisms could include targeted sanctions against aggressor companies or agencies, a shared commitment to not recognize IP resulting from illicit IP transfers, and a “tech-transfer tariff” on products from entities willingly engaged in tech transfer.
- Export-control lists should target only goods that pose national security threats and avoid hindering domestic competitiveness. The Department of Commerce should revise export controls to consider their impact on domestic industry and ease of control in addition to security threats. Restricting the export of non-critical goods impedes the ability of U.S. firms to compete internationally and incentivizes competitor countries to develop their own industries. Controls should focus on hardware, which is difficult to replicate and can be more readily geographically controlled than software. High-end semiconductors in particular are an essential input for other breakthrough technologies. Controlling their flow provides leverage in the broader technological competition. To ease their burden

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on smaller business and increase compliance, export-control licensing processes should be streamlined, automated, and made user-friendly.

Conclusion

The United States' dominance in science and technology was forged in large part by a foreign-born talent pool. Myopic and inflexible policies have allowed this advantage to ebb, while at the same time competitors have waged a decades-long strategic campaign on multiple fronts to close the technological gap. We as a nation can no longer afford to rest on our laurels. We must proactively design immigration policies that fortify our competitiveness in science and technology. Our nation's unparalleled ability to attract top global talent is a sharp weapon that confers an unfair advantage. Instead of seeking to blunt its prickly edges, it is time we wield it to our benefit.

Frequently Asked Questions

How were policy recommendations in this memo evaluated and prioritized?

Recommendations were prioritized by optimizing a set of factors based on their comparative advantage, i.e., their net utility when compared to other alternatives (including the status quo). The three top factors considered were:

- (1) The level of risk of the issue that the policy is targeting according to its likelihood and threat. For instance, cyber-espionage is a higher priority than physical espionage because it is more prevalent and more costly to the U.S. government and economy.
- (2) The feasibility of the policy. Costly, complicated, and/or ineffective methods should be discounted in favor of simple policy changes and evidence-based methods.
- (3) The net positive and negative externalities of the policy. For instance, restricting immigration of citizens of an adversary nation will provide security benefits by reducing the risks of espionage and its associated economic and security costs but will also impose costs in the forms of reduced revenue from tourism and tuition, lost business transactions, foregone foreign workers' contributions to GDP, and intangible losses to innovation as foreign talent returns home.

Doesn't the Biden Administration's "U.S. Citizenship Act of 2021" solve many of the problems addressed in this memo?

The proposed U.S. Citizenship Act makes positive steps toward embracing immigration as an American strength. However, its primary focus is on addressing the migration crisis, undocumented immigrants, family-based immigration, and border safety. These issues, while important, will not significantly broaden the STEM talent pipeline to the United States.

The U.S. Citizenship Act does include several provisions aligned with proposals in this memo to help bolster U.S. competitiveness. These are:

- Improvements to the employment-verification process.
- Protection for workers against labor violations.
- Clearing the green card backlog by recapturing unused visas.
- Increasing the total annual employment-based green card cap from 140,000 to 170,000 while ensuring that spouses and children no longer count against the cap.

These steps primarily focus on reforming America's permanent immigration system. However, most foreign-born high-skilled science and tech workers in the United States initially arrive on student and temporary work visas. To fully leverage the immigration system to enhance U.S. strength in S&T, any reform to immigrant visas should be paired with reforms to student and

temporary work visas. Just as temporary workers and students provide a proven reservoir of talented immigrants, the growing backlog of green card petitions prevent talent already in the United States from investing in a life here.

Shouldn't the United States focus on domestic investments in educating our own science and technology workforce?

Yes. Increasing domestic STEM investments is essential for strengthening U.S. competitiveness in science and technology. However, domestic programs alone are not sufficient to compete with countries who have populations four times our size. The presence of international talent also augments home-grown talent by exposing U.S.-born individuals to a greater diversity of research expertise. STEM policy is not a zero-sum endeavor. Domestic and international talent policies should build off each other to extend U.S. leadership in science and technology.

Won't increasing foreign talent in STEM fields displace Americans?

The shortage of highly skilled talent in STEM fields means that, for the most part, foreign talent will fill open positions rather than displace Americans from jobs they already hold. By helping the U.S. innovation economy grow, the presence of foreign STEM talent will increase the total number of S&T jobs available even as they fill some of those jobs. Creating entrepreneurial visas will make it easier for foreign S&T talent to start and grow businesses in the United States that employ domestic S&T talent. Conversely, when companies are unable to fill open positions with qualified candidates, they are likely to transfer those positions overseas where they can be more easily staffed.⁵⁹

Won't increasing the work-visa cap drive down wages in the labor market and displace American workers?

Theoretically, reducing the supply shortage in the labor market by increasing the work-visa cap could have this effect. But data shows that this generally does not happen in reality. Many businesses struggle to fill positions requiring STEM skills from the domestic labor pool alone. H-1B workers earn more on average than Americans in the same age and occupation cohort, vacancies with H-1B requests stay vacant longer than those without, and wage growth is higher for H-1B occupations than average.⁶⁰ These factors indicate that positions filled by foreign workers continue to outnumber qualified applicants.

There is one significant exception where wage depreciation has been correlated with an increase in use of work visas. Some so-called "outsourcing companies," most prevalent in the IT services industry, hire foreign workers at salaries at or near \$60,000. This is below what

⁵⁹ Youyou Zhou, "Do Restrictions on H-1B Visas Create American Jobs?" *The New York Times*, May 8, 2021, <https://www.nytimes.com/2021/05/08/business/dealbook/h1b-visas-us-jobs.html>.

⁶⁰ Jonathan Rothwell and Neil G Ruiz, "H-1B Visas and the STEM Shortage," *Brookings* (2013), <https://www.brookings.edu/research/h-1b-visas-and-the-stem-shortage/>.

skilled American professionals in the industry tend to earn. Immigration law contains provisions ensuring that workers are paid a prevailing wage and so do not replace American workers at lower cost. However, existing law does not cap the number of H-1B petitions that a single company can file—a problematic loophole. Today, just 13 “outsourcing companies” flood the petition system with about one third of all H-1B petitions.⁶¹ This results in a large number of foreign workers concentrated in the IT services industry, which does seem to depress wages in that industry. Congress should close this loophole by setting work visas caps according to each industry’s need and by replacing the lottery system with a system that prioritizes critical-need positions.

Will requiring Visa Officers to focus on adjudication quality in addition to quantity stretch their resources too thin?

Front-line Visa Officers are usually first- and second-tour Foreign Service Officers who go through rigorous sets of tests and vetting to gain the privilege of serving as U.S. diplomats. If we are prepared to trust them to make delicate policy decisions affecting national interests, we should expect them to be able to balance more than one variable while making visa decisions. Certainly, Visa Officers should be provided with the tools and training to make better decisions and allowed more time to make these decisions. At many embassies and consulates, Visa Officers are currently required to perform more than 120 visa interviews in a four-hour window.⁶² Thoughtful decisions are not made at this pace. Some of the above proposals, such as automating visa processes and shifting analysis to expert systems and LES, are designed to help mitigate the time-pressure that prevents Visa Officers from making thoughtful decisions.

If national security is a priority, why propose eliminating visa interviews for routine travel?

Visa interviews are costly, disruptive, and ineffective. The United States is the only country that requires interviews for routine travel. There are no data to either support or delegitimize use of interviews for visa processes specifically, but there is evidence from other fields that interviews decrease adjudicators’ ability to judge applicants effectively. For instance, machines outperform human experts (judges) by up to a 30% when judging the likelihood of recidivism for parole applicants.⁶³

⁶¹ Haeyoun Park, “How Outsourcing Companies Are Gaming the Visa System,” *The New York Times*, Nov. 10, 2015, <https://www.nytimes.com/interactive/2015/11/06/us/outsourcing-companies-dominate-h1b-visas.html>.

⁶² Theoretically, this was capped at 120 interviews per day by State under Secretary Rex Tillerson. However, visa units quickly found ways around this cap. At the author’s previous post, 120 was construed as a minimum speed, and during peak periods, Visa Officers were expected to interview ~150 applicants per day. Source: Michael Shear, “Trump Administration Orders Tougher Screening of Visa Applicants,” *The New York Times*, March 23, 2017, <https://www.nytimes.com/2017/03/23/us/politics/visa-extreme-vetting-rex-tillerson.html>.

⁶³ Zhiyuan Lin, Jongbin Jung, Sharad Goel, and Jennifer Skeem, “The limits of human predictions of recidivism,” *Science Advances* EAAZ0652 (14 Feb 2020): 6-7, <https://advances.sciencemag.org/content/6/7/eaaz0652>.

How can we ensure that AI systems designed to assist in adjudication and security screening will not be biased?

No system is perfect, and visa decisions will always be a question of making decisions based on incomplete data. The question is: will AI systems be less biased than human adjudicators? This is almost certainly the case: AI algorithms reduce human subjective biases by learning to consider only the variables that increase their predictive accuracy.⁶⁴ Even so, AI systems should be intentionally designed from the ground up to reduce bias. Steps towards this goal include:

- Assembling interdisciplinary teams—comprising computer scientists, immigration experts, legal experts, and ethicists—to design the models.
- Prioritizing transparency by building interpretability into AI models at the engineering level and making results explainable (i.e., avoiding “black box” systems).
- Considering upstream causes of bias, such as bias in data used to build the models. An equitable distribution of data should be selected, and variables prone to bias, such as race, gender, and socioeconomic status, should be carefully normalized.

Won't reducing the scope of security screening expose our nation to more technological espionage?

Current screening procedures are like a wide net with large holes. Sophisticated and malicious users conceal their affiliations and easily slip through the net, while honest or naive applicants are snagged. However, there has been no attempt to estimate false positives (people who were screened out but posed no real threat) and false negatives (people who passed screening but shouldn't have). We need more data to weave a better net, and security agencies need to prioritize data collection. For now, though, the best evidence suggests that focusing on more thorough and sophisticated screens to prevent tech transfer where threats are greatest would be a much better use of our national security resources. A smaller net with tighter holes, strategically cast, will be more effective than the expansive but loose nets currently in place.

Shouldn't we focus our efforts at shutting down China's S&T talent-recruitment efforts instead of increasing immigration?

We should of course act to shut down China's illicit programs to recruit S&T talent. However, the majority of China's arsenal of recruitment programs are legal, so there are limited grounds to take action against them. It is important to recognize that China's decades-long global recruitment efforts have not matched expectations in their ability to attract top talent from abroad. For instance, China's Thousand Talents program has recruited more than 7,600

⁶⁴ Jake Silberg and James Manyika, “Tackling bias in artificial intelligence (and in humans),” *McKinsey Global Institute*, (June 6, 2019), <https://www.mckinsey.com/featured-insights/artificial-intelligence/tackling-bias-in-artificial-intelligence-and-in-humans>.

scientists and engineers of which fewer than 400 were non-citizens.⁶⁵ Despite large investments in recruiting programs and state-of-the-art science and tech centers, China's efforts at recruiting international talent have faced and continue to face steep political and cultural barriers. The United States will find its resources much better utilized by focusing on where it has the most control and where it can be most effective: capitalizing on the pipeline of international talent already eager to study and work in the United States.

If lower socioeconomic status (SES) correlates with visa misuse, isn't it justified to use SES as a factor in adjudicating student visas in order to protect our borders?

The goal is to admit legitimate students and refuse illegitimate students. There are two basic ways to sort applicant pools into groups of legitimate and illegitimate students. The first is to select for illegitimate students. Currently, that involves profiling applicants based on high-fraud characteristics including SES.⁶⁶ However, as very few applicants are fraudulent,⁶⁷ using this method will lump a large number of poorer but legitimate, high-potential students in with the rare fraudster. The second method is to select for legitimate students. The results of this approach are only as good as the selection process used, but it avoids the structural bias inherent to the first method.

There are narrow cases where SES can be a relevant factor in adjudication. For instance, family finances are a pertinent factor in demonstrating that students have a valid financial plan to pay for their tuition and living expenses. Academic institutions already verify financial ability before their school's designated officials can issue students a Form I-20 ("Certificate of Eligibility for Nonimmigrant Student Status," authorized by SEVP), so this should not be a factor in the visa adjudication unless fraud is suspected. Still, the information the schools use to verify the students' financial means is relevant and objective information and should be available to consult in the joint SEVP database proposed above.

On the other hand, it is an open secret that wealthy foreign students often game college-admissions processes, including by hiring "admission coaches" and ghostwriters for their college-admission essays. The upshot is that students from modest backgrounds that gain admission into a given school are more likely to have done so on their own merits and more likely to be top talent than students from high-SES backgrounds.

⁶⁵ Wm. C. Hannas and Huey-meei Chang, "China's Access to Foreign AI Technology," *Center for Security and Emerging Technology* (Sep. 2019), https://cset.georgetown.edu/wp-content/uploads/CSET_China_Access_To_Foreign_AI_Technology.pdf.

⁶⁶ There is some correlation, as poorer applicants are incentivized to commit a disproportionate share of the types of visa fraud that are most visible, i.e., overstays and working without authorization.

⁶⁷ This varies greatly by country. For China, it is likely below 1% of total applicants.

Given that the majority of proposals in this memo can be administered by agencies under existing authorities, why is it necessary to form CTIC?

Many of the proposals in this memo can and should be implemented without CTIC oversight. However, the existence of a central nexus like CTIC will better facilitate complex interagency immigration processes. CTIC will also serve key additional functions:

- (1) It will serve as a basis of accountability for structural reforms to immigration policy as new evidence emerges and geopolitical factors change.
- (2) It will conduct and coordinate evidence-based research on immigration policy, with a focus on enhancing national competitiveness.
- (3) It will bring attention to the impact immigration policy has on national competitiveness.

Why does this proposal recommend that data services and systems upgrades be conducted in-house rather than by contractors?

For State to outsource consular systems would be like Google outsourcing search algorithms. U.S. government agencies have historically used contractors for upgrading and maintaining data services and systems. But making U.S. government agencies more efficient—and better able to develop and implement sophisticated technologies and analytic tools—is essential for strengthening the long-term competitiveness of the United States. Overreliance on contractors has caused in-house technical capacity at federal agencies to wither. This memo proposes that agencies begin to rebuild this capacity by designing and building core systems in-house and assembling teams comprised of domain experts, budget and planning personnel, and technical experts to evaluate what ancillary systems can be most efficiently outsourced. Integrating technical experts into the hierarchy will be an important step to achieving a culture of technical literacy.

How much would the proposals in this memo cost?

Creating a core CTIC team will cost about \$6–10 million in salaries, systems, operational costs, and overhead, assuming that CTIC will complete its mission in a two to three-year timeframe.

Updating Consular systems and security systems has the steepest price tag. Under the ConsularOne initiative, a 10-year, \$850 million indefinite delivery and indefinite quantity contract was awarded to Northrop Grumman Corporation to modernize and consolidate the 92 Consular systems.⁶⁸ CA should request that the upgrades proposed herein be rolled into the modernization efforts. Upgrading other systems, such as those employed by USCIS and shared databases, has costs comparable to costs of modernizing other federal systems: e.g., in the

⁶⁸ “Northrop Grumman Awarded 10-Year, \$850M State Department System Modernization Contract,” Northrop Grumman, (June 22, 2018), <https://news.northropgrumman.com/news/releases/northrop-grumman-awarded-10-year-850m-state-department-system-modernization-contract>.

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\$500,000 to \$20 million range. The cost of upgrades needs to be considered in the context of the cost of maintaining and operating legacy systems. For instance, the Consular Lookout and Support System alone cost \$18.5 million to maintain over a 27-month period.⁶⁹ The opportunity cost of system outages, less efficient adjudications, and addition time spent on administrative tasks resulting from outdated systems and scaled by over 10 million adjudications per year far exceeds the cost of shifting resources to meet the upgrade need. However, the true value of modernization lies in system capabilities. Upgraded systems strengthen security and improve adjudication accuracy. This in turn will allow Consular Officers to issue a larger percentage of visas with a lower risk threshold. Even a 1% increase in visas will in turn generate at least \$256 million in U.S. travel and tourism-related exports per year.⁷⁰

⁶⁹ "Audit of the Bureau of Consular Affairs, Office of Consular Systems and Technology, Administration of Selected Information Technology Contracts," *U.S. Department of State and Broadcasting Board of Governors, Office of Inspector General* (2017), https://www.stateoig.gov/system/files/aud-cgi-17-38_-_web_posting_review.pdf.

⁷⁰ There were 8.7 million nonimmigrant visas issued in FY2019. The average foreign traveler spends at least \$2,900 per year: likely an underestimate for visa holders, as the \$2,900 figure number reflects tourist and visitor spending, while foreign students and workers typically spend much more. Source: "Nonimmigrant Visas Issued by Issuing Office (Including Border Crossing Cards) Fiscal Years 2011-2020," *U.S. Department of State*. (2020), Table XVIII, https://travel.state.gov/content/dam/visas/Statistics/AnnualReports/FY2020AnnualReport/FY20AnnualReport_TableXVIII.pdf.



About the Author

George Hovey was a Consular Officer in the U.S. Foreign Service. He served at the U.S. consulates in Shanghai and Chengdu, where he worked to mitigate technology transfer, combat visa fraud, and increase adjudication effectivity. He helped shape the consulates' response to the initial COVID-19 outbreak. After taking part in the historic closure of the U.S. Consulate in Chengdu, George returned to the United States to work on the Department of State's coronavirus taskforce. George's areas of interest include Greater China, ethics, emerging technology, and transforming institutions through evidence-based policy.



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