Global Talent and U.S. Immigration Policy

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Abstract: Talent is a critical resource for today's knowledge economy. The United States has benefited substantially from high-skilled migration since the 1970s, especially with respect to innovation and entrepreneurship. This chapter reviews data on these immigrant contributions, and it discusses the important roles played by universities and firms under the American system. The chapter concludes with ways that US immigration policy could be enhanced, which will become more important as other nations become more competitive for global talent.

Introduction

Talent is the most valuable resource in our modern, knowledge-intensive economy, and the global distribution of talent shapes the competitiveness of firms, the strength of our economy, and the social fabric of our communities. This chapter describes the movement of talent and the policies that shape these people flows, which are among the most important decisions countries make. While America has benefitted substantially from inflows of global talent since the 1970s, this lure has often been because of the economic or social features of our country, rather than a particularly effective policy environment. US leaders have an opportunity to design a better immigration system that will improve US competitiveness in the decades to come.

Most of this chapter focuses on employment-based migration for skilled work. Employment-based migration is a modest share of immigration to America, with family-based migration accounting for the majority of green cards granted each year. While many migrants entering through family-based channels work hard and pursue the "American Dream", the policy objectives and potential reforms to family- vs. employment-based categories are quite different, and respondents to public opinion polls have divergent feelings regarding the categories. I thus focus primarily on potential changes to employment-based migration policy, touching upon comprehensive immigration reform at the end of the chapter.

Regardless of who occupies the Oval Office on January 20, 2021, America faces challenging immigration policy issues that have been building up for more than two decades. The rhetoric around immigration is far more caustic than it was before 2016, and it may become far worse as the COVID-19 pandemic plays out and politicians ascribe blame during the election cycle. But, beyond the headlines, most of the issues described in this chapter are about outdated features of the US policy structure that don't fit well with the modern economy. As the world becomes more competitive and attractive for global talent, each missed opportunity to update our system makes us less competitive in the future.

This chapter pulls from *The Gift of Global Talent: How Migration Shapes Business, Economy, and Society* (2019), in which I present a comprehensive portrait of high-skilled immigration flows, mixing economic, business, and policy elements for the United States and other countries. Here, I provide a practitioner-oriented exposition of a few key themes, with the book providing additional resources and thoughts. In parallel work, Kerr and Kerr (2020b) also elaborate on some of the policy ideas presented here.

Background on skilled US immigration

Most US policy makers want to attract talented individuals to the country, but what constitutes talent is difficult to define. Talent exists on a spectrum and combines both education and innate ability, and single yardsticks like possession of a college degree are always imperfect. Yet, when one analyzes and compares groups of skilled individuals, regular patterns emerge. This section considers three groups: Nobel Prize winners, inventors, and college graduates.

The United Nations estimates about 272 million migrants globally for 2019, or about 3.5% of the world's population. This share has risen slightly from about 3% in 1960. Compared to the global flow of goods (trade) and financial capital (investment), the flow of people has been substantially less (World Bank 2017). While refugee crises have been sadly prominent in recent years, only about 10% of migrants are refugees.

The United States is a key destination country, home to about 19% of migrants. This share is five times the 4.25% share of the global population living in America. Of the 50 million migrants in the United States, just over half of them are women and more than three-quarters are working age adults (UN DESA 2019).

Rates of migration increase as talent levels rise, with the most talented individuals being the most mobile (Kerr 2019a, Docquier and Marfouk 2006). Migrant scientists working outside of their country of birth have won one-third of the Nobel Prizes in Chemistry, Medicine, Physics, and Economic Sciences since 1901. A step down in the talent hierarchy, about 10% of global inventors are migrants (Miguelez and Fink 2013). Among inventors, migration rates increase with talent. The top 5% of inventors are five times more likely to migrate than less-productive ones (Akcigit et al. 2016). Finally, college-educated individuals migrate at three times the rate of those who only completed secondary school. Taking this continuum of talent as a whole, Nobel Prize winners migrate at a rate 17 times higher than that of high school graduates.

The vast majority of high-skilled migrants reside in advanced economies. While accounting for only 20% of the world's population, OECD nations are home to more than two-thirds of college-educated migrants. The United States has historically captured 40-50% of this inflow to OECD nations, followed by the United Kingdom, Canada and Australia (Kerr et al. 2016, 2017). By comparison, lower-skilled migration is much more diffuse, with migrants more likely to move within their local region of the world and to a broader range of countries. This is consistent with the most talented individuals having a better cost-benefit ratio for long-distance moves compared to lower-skilled workers. The preference for the United States further grows by talent level: more than 50% of migrating inventors or Nobel Prize winners moved to America for their work (Kerr 2019a). Figure 1, taken from Miguelez and Fink (2013), uses World Intellectual Property Organization Data to show inventor mobility during 2000-2010.

Figure 1: Net global migration of inventors, 2000-2010
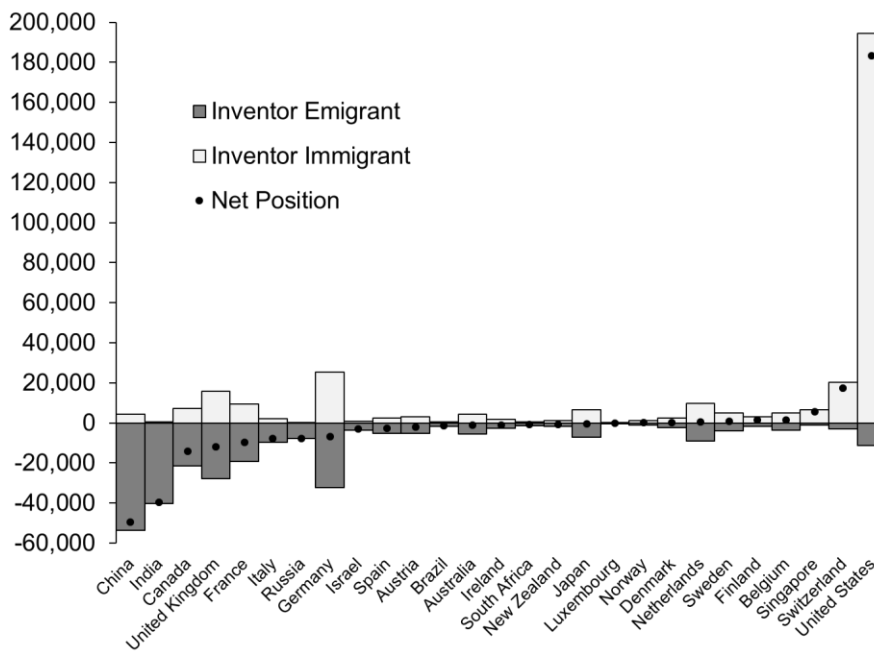
Even in a country of the United States' size, immigrants account for a significant share of US talent and thereby influence the economy substantially. Immigrants make up about 17% of US college-educated workers and 14% of the total workforce. This 17% represents a substantial shift from 1980, when immigrants represented 7% of the college-educated workforce (Hanson and Liu 2018; Ruggles et al. 2019). The immigrant concentrations are even higher in more skill-intensive and technical fields: 29% of college-educated STEM (Science, Technology, Engineering, and Mathematics) workers and 52% of doctorate holders were born outside of the United States. The WIPO data also show a large share of American-based inventors are immigrants (Wadhwa, Jasso, et al. 2007; Wadha, Rissing, et al. 2007), and about 33% of US-based Nobel Prize winners are foreign born.[1]

Immigrants have also had a substantial impact on US business creation. Kerr and Kerr (2020) measure that about 25% of US entrepreneurs are foreign-born in recent years, and Partnership for a New American Economy (2011) calculates 40% of current *Fortune 500* companies were founded by first- or second-generation immigrants. In Silicon Valley, immigrants lead half of engineering and technology start-ups (Wadhwa, Rissing, et al. 2007). This example illustrates a broader pattern of global talent concentrating spatially in a few key clusters. These talent clusters can enhance the productivity of talented workers working in close proximity (Carlino and Kerr 2015), and Kahn and MacGarvie (2016) show how access to a frontier economy boosts scientific productivity.

The main driver of migration at this individual level is the pursuit of opportunity. The least-skilled migrants can gain the opportunity to earn a living wage and raise their family in a stable environment. For skilled migrants, migration has the potential to unlock educational and professional opportunities. In one clever study, Clemens (2013) estimates a $55,000 average gain for Indian workers who win the US H-1B lottery compared to their peers who do not. This represents a lower bound of the range of economic benefits for skilled workers, as one can easily imagine superstars earning exceptionally high wages that would be unthinkable in their home country. Others migrate for personal reasons—many younger individuals want to live in a global city like London or New York, and others migrate to be near extended family members.

Sadly, the world is currently facing several significant refugee crises as well (Dustmann et al. 2017). Although humanitarian factors should guide choices regarding refugee/asylum seekers, they can influence talent distributions. Migrants fleeing Nazi Germany significantly reshaped and expanded the field of chemistry in the United States (Moser et al. 2014). While this is an extreme example, the worst crises dislocate people of all skill and talent levels.

The rest of this introduction delves more deeply into two aspects of skilled migration that link to policy considerations. I first study its well-known link to innovation and entrepreneurship. I then consider how women represent an ever-rising share of migrants, which is lesser known.

Innovation and entrepreneurship
Immigrants account for about a quarter of all US innovation and entrepreneurship, and two of our earlier examples (inventors, Nobel Prize winners) speak to how these contributions exceed the general share of

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[1] Work in this area includes Stephan and Levin (2001), Ottaviano and Peri (2006), Hunt and Gauthier-Loiselle (2010), Kerr and Lincoln (2010), Borjas and Doran (2012), Peri et al. (2015), Bernstein et al. (2019), Buchardi et al. (2019), Doran and Yoon (2019), Docquier et al. (2020), and Moser and San (2020).

immigrants working in the US economy. *The Gift of Global Talent* examines in greater depth why global talent flows have had such a deep impact on US innovation and entrepreneurship, with this section emphasizing several policy-relevant features.

It is first important to understand why immigrants contribute disproportionately to STEM fields and outcomes like patents, publications, and firm starts. Careful research by Hunt (2011, 2015) shows that immigrants do not possess some hidden superpower for innovation. Instead, most of the greater contribution is due to immigrants having higher educational attainment and being more likely to focus their education on STEM-related fields. This explanation does not devalue the importance of immigrants having made these investments; to the contrary, it highlights that policy frameworks can utilize information like education history to target STEM-based contributions if so desired.

Policy makers also need to be aware that high-skilled migrants from China and India have been most responsible for the growth in global talent. These two countries accounted for one-fifth of the total immigrant flow into the OECD from non-OECD countries through 2010 (with continued growth thereafter), and their particular impact on US invention is striking. Using ethnic name matching algorithms from Kerr (2008), Figure 2 shows how Chinese and Indian ethnic inventors grew from less than 3% of US patents in 1975 to nearly 20% in 2018. Comparable growth rates are present in other STEM-related metrics like occupational shares and student enrollments.

*Figure 2: Ethnic share of US domestic patenting*
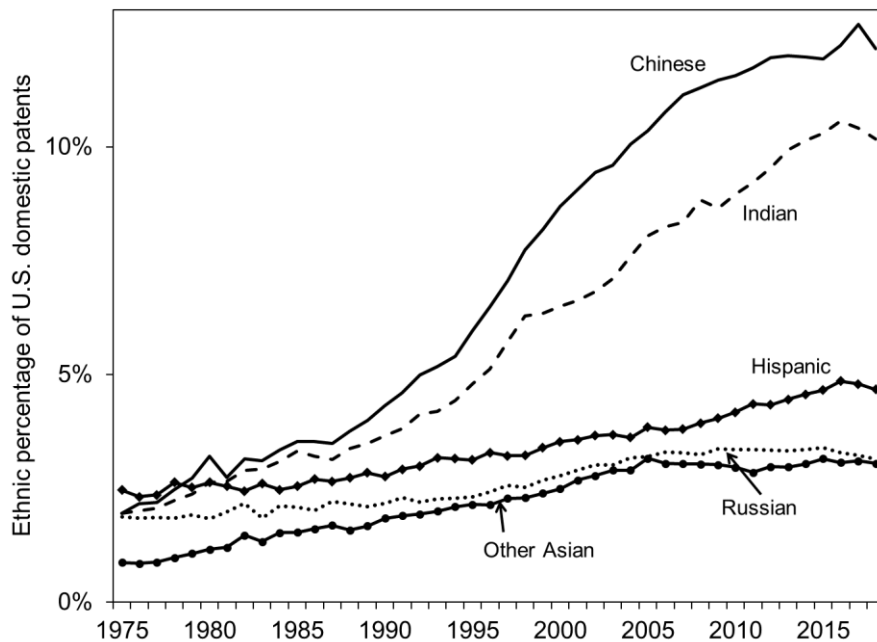
While immigrant inventors play an important and growing role in most every technology field, they are especially important in advanced technologies and software. Companies located in major tech clusters and with a computer- and software-heavy focus tend to have the highest shares of ethnic inventors. Since

2005, ethnic inventors who are not of Anglo-Saxon or European origin account for more than 40% of patents from Google, Intel, and Oracle, compared with less than 20% from 3M, Boeing, and Procter & Gamble. Most large companies fall in between these extremes.

The starkest concentration, however, is geographic, and the rise of key talent clusters such as Silicon Valley and Boston via global talent have a substantial impact on US business and economic geography. To illustrate, Chinese and Indian inventors located in the San Francisco Bay Area developed or co-developed about one in every 220 US domestic patents in 1975. Today, that share has grown to one in every 11 patents! To place this in perspective, this means that two ethnic groups in one super cluster now patent more than the whole state of New York. Or, if one adds up states with the least patenting, one in every 11 patents is equal to the combined patenting contribution of the bottom 28 states in America.

First-generation immigrants found about 25% of new firms in America, but this share exceeds 40% in states such as California and New York.[2] In many respects, these immigrant contributions for entrepreneurship and their growth over time resemble those for invention, but there are some key differences. Immigrant entrepreneurship is less concentrated across ethnicities, industries/technologies, and locations than invention. Firms founded by immigrants are broadly similar to those founded by natives, though some documented differences arise in terms of wage rates, benefits offered, and engagement in international activities (Kerr and Kerr 2020a).

Figure 3: Share of immigrant-founded firms in 2012 by sector

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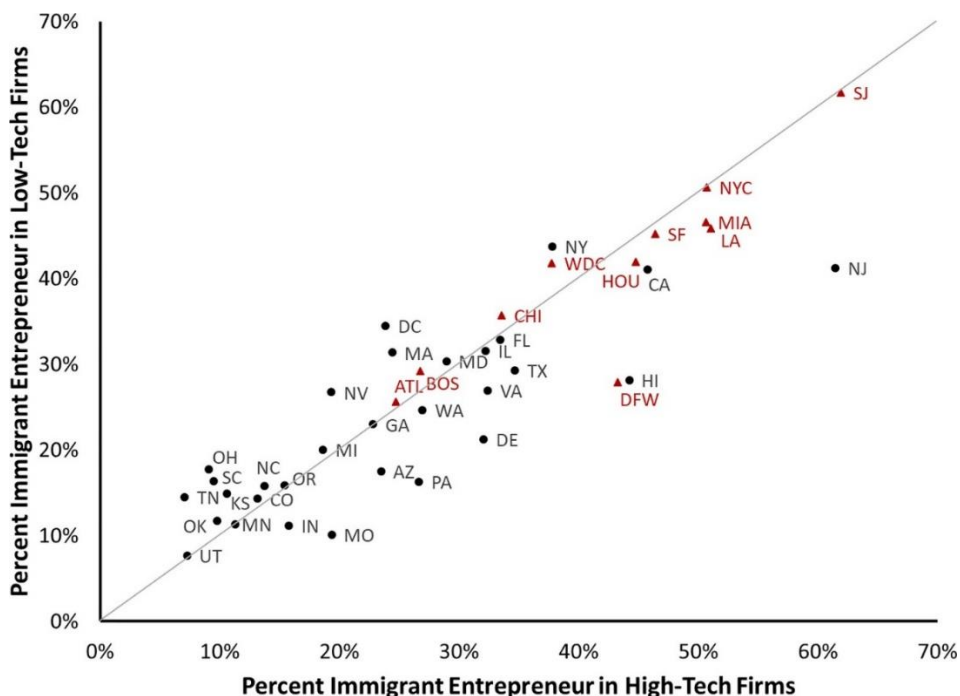
[2] See Saxenian (1999, 2002), Fairlie and Lofstrom (2014), Kahn et al. (2017), Kerr and Kerr (2017, 2020a), and Brown et al. (2019).

Taken from Kerr and Kerr (2020a), Figure 3 plots states (circles) and top metropolitan areas (triangles) by their share of high- and low-tech immigrant entrepreneurship using 2012 Survey of Business Owner data (including firms co-founded with natives). There is a strong correlation between the two, with San Jose having more than 60% of new firms founded by immigrants. Kerr and Kerr (2020a) highlight four factors—entrepreneurial personality, opportunity-based migration, weaker labor market prospects and co-ethnic social bond—that contribute to higher rates of entrepreneurship among immigrants.

Innovation and entrepreneurship raise long-run standards of living and boost US competitiveness. A 2019 survey conducted by Harvard Business School on US competitiveness polled business leaders and members of the general public on foreign skilled workers and their role for US competitiveness (Porter et al. 2019). Business leaders and respondents across the political spectrum all showed net agreement that foreign skilled workers have a net positive effect on the US economy, especially with respect towards innovation. There was also broad agreement that the United States should emphasize more employment-based migration to the country. Unfortunately, there was less agreement about how best to move forward in the short-run, with the general public also expressing confusion/uncertainty on multiple policy topics. This survey thus confirms a broad-based recognition of the core benefits discussed up to this point in the chapter, but also foreshadows the complexity of designing and achieving further policy improvements.

Gender

Picture a skilled migrant in your mind. More than likely, your first image was of a man, but women now represent a bit more than half of skilled worker flows.[3] Beneath this surprising fact, the situation is more complex and highlights an important future policy consideration. While the stock of skilled female migrants in top receiving countries is growing quickly, the majority of female migrants enter as dependents or through family-based pathways. The share of skilled women entering as the leading migrant through employment- or points-based channels is relatively low, which is perhaps partly due to poor suitability to traditional immigration policy structures.

The structure of the US immigration system for employment-based work is most amenable for the average, male skilled immigrant. This comes at the cost of ignoring the distinct experiences of women (and missing the heterogeneity among men). Redesigns that reflect better the role of women have been important in diverse areas like automobile seatbelt design, office temperature, and the shape of police body armor, and nations can make themselves more attractive to skilled female migrants with similar thoughtfulness. Boucher (2016) analyzes gender awareness of skilled immigration policies across OECD countries.

Immigration systems can be gender biased in different ways. Points-based countries, such as those found in Canada or Australia, determine which high-skilled migrants to admit based upon human capital factors of the applicant (e.g., age, language ability, education). In some countries (e.g., Canada), points are also awarded for the human capital of the applicant's spouse, but the emphasis on the spouse is minor. These systems risk gender bias in point allocation design. A preference for workers under 30 may equally favor

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[3] Work on this topic includes Docquier et al. (2009, 2012), Adserà and Ferrer (2014), Kofman (2014), Nejad and Young (2014), IOM and OECD (2014), Boucher (2016), Ruyssen and Salomone (2018), and Kerr (2019b).

young men and women, but excluding older workers or requiring uninterrupted career histories disproportionately affects women who leave the labor force during child bearing.

Employer-based immigration systems, like those used in America, do not inherently favor any one gender, but employer selection of candidates may reproduce existing biases. Firms hiring foreign workers rely on existing networks and other soft skills such as 'cultural fit' or 'perceived overall employability', which may disadvantage women applicants (Boucher 2016). European countries using an employer-driven system further impose requirements based on occupations and wage thresholds. While these safeguards can be beneficial (and I later discuss them for the United States), policy makers must exercise care that priority occupation lists do not overwhelmingly emphasize male-dominated occupations and that wage thresholds do not fall victim to pre-existing gender pay gaps present in most advanced economies.

Once a high-skilled female migrant enters the United States, she may face additional decisions unlikely to affect her male peer. For example, policy rules protect H-1B workers under the Family and Medical Leave Act (FMLA) that provides job protection for workers to take unpaid leave in the event of personal or family medical needs; women often use FMLA for maternity leave. However, H-1B eligibility is contingent on documentation of a paycheck and the absence of one during an FMLA leave is the burden of the worker. This additional uncertainty may lead female migrants to delay childbearing until after their H-1B period ends or they obtain permanent residency.

Boucher (2016) suggests three ways in which countries can make their immigration policy more gender aware: establishing gender units, conducting gender audits, and publishing gender-disaggregated data. Currently, gender-disaggregated data for the United States is available but not widely shared (Brücker et al. 2013, Kerr 2019b). Looking ahead, gender issues will become ever more essential for migration policy. Women now represent the majority of US college students and of students studying outside of their home country, and these shares continue to grow. As these graduates become the recruitment pool of skilled employees for tomorrow's companies, the strongest policy environments will ensure equal footing for both genders.

US immigration policy situation

The United States admits more immigrants than any other country in the world. Net migration to the United States was 4.5 million people over a five-year period to 2017, nearly double the rate of the next highest country, Germany. The relative rate of immigrants per capita in the United States is 14%-15%, which is similar to or above most other OECD countries (World Bank 2017).

The vast majority of immigration to the United States comes through family-based migration. The United States grants about one million "green cards" (permanent residency) each year. Immediate family members of US citizens receive the majority and there is no annual cap on visas granted for family reunification. By contrast, the United States reserves only 140,000 green cards for employment-based migration, and family members of the employment-based migrant count towards this cap. Unlike the United States, Canada's immigration system emphasizes employment-based migration much more than family reunification.

This chapter does not cover all of the pathways through which skilled migrants enter the United States. The system is very complex, and many migrants touch upon multiple channels: for example, a migrant

who first enters America on a student visa, who then obtains a first job on an employer-sponsored work visa, and who ultimately gains a green card through a family-based visa after marrying an American. Hunt (2011) provides a rare example of an academic study considering specific channels. Instead, I continue by framing conceptually the two most important gatekeepers for US talent flows: universities and firms. In many ways, these gatekeepers are as important, if not more so, than government under the US system for long-term employment-based migration given their role in selecting candidates.

Universities as gatekeepers

Universities shape the skilled immigration pool through their selection of international students who receive F1 (student) or J-1 (exchange visitor) visas (Bound et al. 2015, 2016). Including renewals, the United States issued 362,929 F1 visas in 2018 (US Department of State 2019). While an F1 visa does not offer students long-term work authorization or residency, it often is a first step to a temporary employment visa. In 2018, two-thirds of H-1B petitions approved for initial employment (58,214) were filed on behalf of immigrants already in the United States and in 2017, the most recent year for which data is available, 34,488 H-1B visas were allocated to individuals transitioning directly from an F1 visa (USCIS 2018, 2019).

Kato and Sparber (2013) emphasize how foreign students consider future access to labor markets when selecting colleges. They show that a modest reduction in likely student access to H-1B visas in 2004 upon graduation led to fewer international student applications, especially among the most qualified candidates. This study highlights how talented students are especially sensitive to long-term uncertainty in potential destination countries. Recent US policy uncertainty is similarly dampening foreign student interest in America, and some graduate education fields like business schools have witnessed 2-3 years of consecutive declines in foreign applications, over-and-above any changes in application rates from natives (Jaschik 2019). This vulnerability and uncertainty is very concerning.

The linkages between the US education system and students from China and India are complex and may grow increasingly so in the future. Currently, students from China and India account for about half of international students in America, as their shares grew substantially over the last decade. These students overwhelmingly choose STEM programs, making them a natural contributor to the future innovative workforce, and their tuition payments are a vital funding source to cash-strapped universities. Yet, some anti-immigration politicians have increasingly called out foreign students, and especially Chinese students, in America.

Though not eligible for permanent employment, individuals on an F1 student visa can work on jobs connected to their field of study through the Optional Practical Training (OPT) program. Most students are eligible for 12 months of OPT, and those with a STEM degree for up to three years. There is no cap on OPT authorizations, and there were roughly 175,000 active in 2017. Indeed, during the 2000s, a third of foreign-born students entered the US labor market through the OPT program, and today the OPT program is the most common point of entry into the US labor market for skilled workers. While the OPT program serves a valuable purpose, it is increasingly strained by the mismatch of universities and their unlimited capacity to bring foreign students to America with the very rigid H-1B program described next.

Firms as gatekeepers

America utilizes an employer-driven system for the selection of migrants for work-based purposes. Indeed, a potential migrant cannot apply for most employment-based visas; instead, the hiring firm files the application to the government on behalf of the worker it selects. This approach places tremendous power and responsibility in the hands of the firm.

As noted earlier, other countries use points-based programs that emphasize scoring employment-based candidates based upon their traits (e.g., degrees, age, experience). Most countries, including the United States, are really blends of the two archetypical approaches. For example, the O1 visa provides temporary US admission for those with demonstrated extraordinary abilities, and the EB-5 (Employment Based, 5th preference) visa, often called the "millionaire's visa," is available to those willing to invest sufficient sums into a US business that generates jobs for Americans. Despite these categories devoted to individual ability or wealth, the US system emphasizes the role of the firm more than most nations.

An employer-based visa system provides significant advantages, including job guarantees for workers, the potential for better candidate selection, and rapid flexibility to respond to shifts in market demands. The US system avoids unemployment for migrants by conditioning all applicants on a guaranteed job offer (e.g., a candidate in a points-based system could have great education credentials but be in a field with few available jobs). The firm-based system also potentially leads to better employer-employee matches and better overall selection because firms are incentivized to evaluate applicants in ways that points systems find difficult to capture (e.g., very special skillsets, soft skills and team work, creativity).

On the other hand, there are some challenges and liabilities with employer-based systems. I illustrate these next through a depiction of the H-1B visa program, the largest category of admission of skilled workers for employment-based purposes to America. Other large employment-based visas (e.g., the L visa for intra-company transfers) also conceptually make the firm into a critical gatekeeper, but I focus on the H-1B program in this chapter. Many existing features of the H-1B program attempt to circumvent potential challenges of an employer-based system, and some frequently voiced reforms are also seeking to modify the system for better performance.

The Immigration Act of 1990 established the H-1B program to facilitate the temporary employment of workers in specialty occupations. Examples of specialty occupations include computer programming, accounting, engineering, theology, consulting, and medicine. H-1B holders almost universally have a bachelor's education, and the current system (reformed from the 1990 Act as described below) reserves a pool of visas for applicants with a Master's degree or higher from a US university.

H-1B visas are valid for three years, renewable once, and legally ties the H-1B workers to their sponsoring firm. As of 2019, H-1B application fees ranged between $1,600 and $7,400 depending upon employer size, immigrant worker share, and premium processing. These costs are relatively modest compared to the general hiring expenses (e.g., interviews, training, legal fees, etc.) for skilled workers. The expectation is that the worker will leave the United States after their visa expires, but the H-1B also has a "dual-intent" feature allowing sponsoring firms to petition for a green card on behalf of the worker.

The tied employer-employee relationship incentivizes firms to recruit and train foreign workers, but it potentially weakens worker negotiation power. Overtime, reforms have boosted the portability of visas across employers. However, worker mobility is curtailed while waiting for green card processing, which

can take 7-12 years (Hunt 2017; Depew et al. 2017). H-1B workers are thus more vulnerable and dependent on their employer during some of the critical phases of this processing.

The H-1B program seeks to guard against employers paying immigrant workers too little for their skillset (to protect the immigrant from exploitation and to guard against firms using the visa to undercut domestic workers). The law requires an H-1B employer pay the migrant at least the "prevailing wage" based on the worker's position, experience, and qualifications, taking the higher of the rates within the firm or in the local area. In 2016, the mean salary for H-1B visa holders was $80,000, with a range from $60,000 for lower-end coding work to very high-skilled workers earning greater than $150,000 (Ruiz and Krogstad 2017).

While firms can select candidates, the US government caps the annual number of new H-1B visas. Figure 3 shows the evolution of the H-1B cap from an initial level of 65,000 visas to a maximum of 195,000 visas during the internet tech boom and Y2K transition. Demand for foreign workers fell short of the cap during the recession of the early 2000s, and the cap reverted to 65,000 in 2004 due to sunset clauses. A separate cap of 20,000 visas was later added for applicants with a Master's degree or higher from a US institution. The cap only applies to initial employment applications by cap-subject firms, with higher education, qualified non-profits, and governmental research organizations being exempt (along with all visa renewals). In FY2018, the United States issued 179,660 H-1B visas, including renewals.

Figure 4: Annual cap on new H-1B issuances by fiscal year
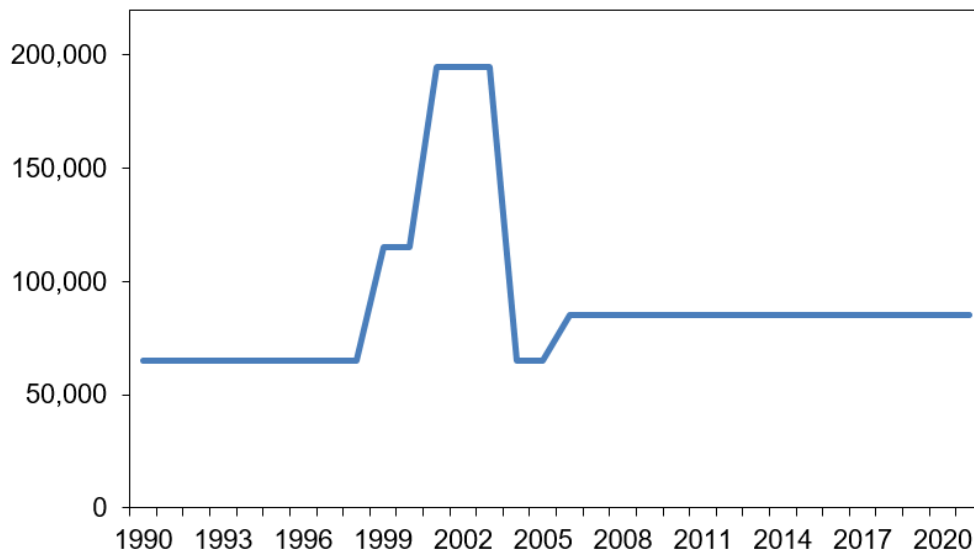
Since the cap reversion in 2004, demand for H-1B visas has exceeded supply in every year. In slow economic times, such as the Great Recession, it can take several months for submitted applications to reach the cap. In these years, the government issues visas on a first-come, first-served basis. In strong years, including every year since 2014, demand exceeds the visa cap by 200-300% within the first few days after the government begins accepting applications. Prior to fiscal year 2021, the government accepted visa applications for the first five business days in April and then conducted a lottery over the received

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applications. In March 2020, USCIS implemented a new two-step application process for fiscal year 2021 with a first registration from March 1st, 2020 through March 20th, 2020, followed by a lottery selection. Early data suggested the government received approximately 275,000 registrations. At the time of writing this chapter, it was uncertain if the USCIS would further modify this new process for future years.

While the H-1B is usable for any specialty occupation, most H-1B visa holders in recent years have worked in computer-related occupations (Kerr et al. 2015a,b). Related, immigrants for India and China have typically accounted for more than 80% of H-1B recipients. At other points in the program's history, these occupational and country-of-origin shares were much less extreme. This concentration is possible because the H-1B program does not have limits or quotas by industry, occupation, country of origin, nor any other dimension. This flexibility allows firms to recruit the exact workers they want, with a consequence being that the composition of visas can fluctuate over time.

As I will describe later, many proposed reforms seek to modify the visa allocation mechanism. Evidence of H-1B visa usage is important for evaluating such proposals. Evidence remains mixed on whether skilled immigrant workers substitute for or complement native workers. Several studies find the hiring of young, skilled immigrants correspond to higher firm employment, but one study found that firms who won the visa lottery reduced employment of native workers in subsequent years.[4] Either way, the evidence does consistently point to firms using the temporary visa programs to help keep their workforces younger, as first emphasized by Matloff (2003). STEM work and computer programming appear particularly vulnerable to this age-based substitution, which partly explains why the H-1B visa features so prominently in these occupations.

The Trump administration has made immigration a central policy issue, with modest direct impact on H-1B (relative to Mexican border action and the travel ban). The administration reversed the order in which the government conducts the two H-1B lotteries. Since 2008, USCIS had conducted the 20,000 visa lottery for applicants with a US Master's degree before it conducted the 65,000 lottery for general applicants. Although intended to offer a "second chance" for Master's degree applicants, it practically resulted in an overall lower share of applicants with Master's degrees winning one of the two lotteries compared to a scenario where the 65,000 general lottery was conducted first. Pathak et al. (2020) analyze the lottery order change from a market design perspective and conclude it will lead to a 6% increase in the share of H-1B visas awarded to Master's degree applicants.

The Trump administration has also implemented process and procedural changes that have been controversial, with some details only emerging via Freedom of Information Act lawsuits. The administration sharply raised denial rates on H-1B, especially for IT service companies engaged in outsourcing efforts. For example, denial rates reached over 30% in FY2019 for IT service providers compared to 2-7% for technology product companies (Anderson 2019, 2020a). There has also been a substantial rise in Requests for Evidence on H-1B extensions compared to earlier administrations. Some recent policy changes were invalidated by a March 10, 2020 US District Court opinion and remain in legal question (Anderson 2020b).

Significant recent debate has also centered on the H-4 work authorization that allows dependent spouses of H-1B workers with approved green card petitions to work. The USCIS is currently considering an end to

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[4] For example, Kerr et al. (2015a,b), Doran et al. (2015), Mayda et al. (2018), and Dimmock et al. (2019). Related work includes Hira (2010), Bound et al. (2017), and Glennon (2019).

this authorization. Some H-1B holders have expressed concern that they will not be able to afford to live in the United States without a second income.

It is challenging to infer from these actions and others the overall philosophy of the Trump administration towards skilled employment-based immigration and the H-1B program. Beyond the President's wildly varying public statements, some actions like the lottery order reversal and pressure against IT service providers appear to reflect a genuine effort to increase the skill content of the program. Other actions appear best characterized as being anti-immigrant wholesale, making the process harder and nastier for all applicants. This is particularly worrisome as most skilled immigrants have global choices, and they will prioritize other destinations as they become more uncertain about what the United States represents and how much faith they can place in a future here. Even more worrisome, if the current experience follows the patterns in Kato and Sparber (2013), this discouragement will be particularly strong among the most talented individuals who have many options in front of them.

US immigration policy proposals

This chapter closes with some potential policy changes that would affect high-skilled immigrants to America and hopefully boost the entrepreneurial and innovation stimulus to our economy. For further discussion and details, please see *The Gift of Global Talent* and, more recently, Kerr and Kerr (2020b). Many ideas below are adjustments to the existing system, while others necessitate broader reforms, and they work backwards from the green card application.

1. **Remove country-level caps to employment-based permanent residency**. Many skilled immigrants and their accompanying family members obtain permanent residency through the 140,000 green cards set aside each year for employment-based (EB) purposes. In addition to the total cap, there is a country-level cap in place. Established with the Immigration Act of 1990 and still in effect today, "the total number of immigrant visas made available to natives of any single foreign state or dependent area" may not exceed 7%. The combination of these two caps creates very long waiting times for some migrants from India and China, even stretching into decades (Kahn and MacGarvie 2018). Several recent proposals suggest increasing or eliminating the country-level caps, and such alleviation would decrease migrant uncertainty, increase worker mobility to help facilitate better employer-employee matches, and allow entrepreneurs to gain permanent residency faster and launch their ventures.

2. **Increase the number of H-1B visas**. An expansion of the H-1B program is one of the most frequently proposed and debated proposals. Most put forward an increase from the current cap to a level between 115,000 and 195,000, but some prominent business leaders, such as Eric Schmidt, the former CEO of Google, propose eliminating the cap all together.[5] Policy makers should also consider indexing future caps to economic conditions and related factors to eliminate the need for future multi-year debates about nominal changes in the cap level.

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[5] Schmidt said in 2017, "The single stupidest policy in the entire American political system was the limit on H-1B." https://money.cnn.com/2017/05/04/technology/eric-schmidt-h1b-visa/.

3. **Adjust the H-1B visa allocation mechanism.** The H-1B is vastly oversubscribed, with approximately 275,000 registrations received for the 2021 fiscal year.[6] The lottery structure used in periods of very high demand is quite crude, giving an entry-level programmer the same chances as an advanced expert. In practice, the lottery likely even leads to greater applications from firms seeking mundane skillsets compared to specialized ones, as the former can "flood the lottery" whereas the latter candidates are hard to find. This is very inefficient, and mechanisms like wage ranking of candidates would be a substantial boost to the efficiency with which our scarce supply of visas is allocated (Sparber 2018). Under this approach, wages proxy for the worker's potential value to the US economy; to the extent that wages and skills are correlated, this structure could also raise the average skill level of visa recipients. Implementation needs safeguards in place to ensure it does not favor overly high-priced industries and cities, established firms, and established workers nor reinforce gender inequities. Establishing a minimum H-1B salary level, replacing the lottery with an auction (Peri 2012), and establishing regional visa system are related and sometimes complementary proposals worth considering.

4. **Adjust school-to-work transitions**. The number of foreign-born students in the United States has swelled to more than one million over the last decade, making them one of the largest pools of skilled workers in the country. Given the fixed supply of H-1B visas, the OPT program is providing an alternative way to enter the labor force. However, this is an imperfect substitute because of the time limit and the uncertainty around what comes next. Policy makers should consider reforms that provide more guaranteed work time to international students after graduation, especially if also implementing mechanisms like H-1B wage ranking (which would put young new workers at a disadvantage compared to older worker with higher salaries).

5. **Comprehensive immigration reform.** Comprehensive immigration reform would potentially alter the total number of green cards allocated each year and/or the relative shares of family- vs. employment-based slots (along with many other potential changes like using a points-based system, providing permanent status to undocumented immigrants, and so on). In the US Competitiveness Survey, there was consensus among business leaders and the general public to adjust the overall composition of US immigration toward employment-based entry, although the details of how that would be accomplished were far less clear (Porter et al. 2019). While there is some tension between the various purposes of the visas, the current employment-based visa reservation is so low that policy makers could double or triple it without substantially changing the overall picture of US immigration if family-based migration stayed as is.

6. **Visas for entrepreneurs.** Countries are increasingly competing to attract the immigrant founders of high-tech and high-growth start-ups.[7] Many countries have introduced targeted entrepreneur visas in the last decade, but US proposals have never made it out of Congress (Kerr and Kerr 2020b). In the United States, aspiring immigrant entrepreneurs without the wealth to access the EB-5 permanent residency track must shift into other existing visa categories (e.g., F1, H-1B) that are not well designed for entrepreneurs (Blume-Kohout 2016, Roach et al. 2018, Roach and

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[6] https://redbus2us.com/total-h1b-registrations-received-for-fy-2021-is-275k-46-masters, https://redbus2us.com/h1b-visa-cap-reach-dates-history-graphs-uscis-data/.

[7] Anderson and Platzer (2006), Fairlie (2012), Hegde and Tumlinson (2014), Bengtsson and Hsu (2014), and Gompers et al. (2016) consider immigrant roles among VC-backed companies and investors. Haltiwanger et al. (2014) and Glaeser et al. (2015) describe employment growth and new firm formation.

Skrentny 2019). Stangler and Knoczal (2013) estimated the lower-bound of the job creation impacts of a start-up visa at nearly 500,000 new jobs over ten years.

When considering these and other proposals, policy makers need to factor in the larger mix of political, social, cultural, and economic factors that shape these decisions. Immigration can spur the country forward, especially in the face of upcoming demographic changes that will result in an aging population and fewer workers. But, as the United States and many other advanced economies debate the right level of global integration, it is crucial to design the policies to spread benefits out more broadly and thereby generate the necessary political support. I write this chapter during the early days of the COVID-19 pandemic spread, and many different scenarios could lie ahead. Yet, in all of them, policy makers will need to grapple anew with how best to design America's skilled immigration system, and it would be a mistake to let more years pass by without making important reforms.

References

Adserà, Alícia, and Ana M. Ferrer. 2014. "The Myth of Immigrant Women as Secondary Workers: Evidence from Canada." *American Economic Review* 104 (5): 360–64.

Akcigit, Ufuk, Salome Baslandze, and Stefanie Stantcheva. 2016. "Taxation and the International Migration of Inventors." *American Economic Review* 106 (10): 2930-2981.

Anderson, Stuart. 2020a. "H-1B Denials Remain High, Especially For IT Services Companies." *Forbes*. February 26, 2020. https://www.forbes.com/sites/stuartanderson/2020/02/26/h-1b-denials-remain-high-especially-for-it-services-companies/.

———. 2020b. "Court Invalidates Key Trump Administration H-1B Visa Policies." *Forbes*. March 11, 2020. https://www.forbes.com/sites/stuartanderson/2020/03/11/court-invalidates-key-trump-administration-h-1b-visa-policies/.

———. 2019. "USCIS Documents Reveal The Sources Of Trump H-1B Visa Restrictions." *Forbes*. September 19, 2019. https://www.forbes.com/sites/stuartanderson/2019/09/19/uscis-documents-reveal-the-sources-of-trump-h-1b-visa-restrictions/#55906e82760f.

Bengtsson, Ola, and David H. Hsu. 2014. "Ethnic Matching in the U.S. Venture Capital Market." *Journal of Business Venturing* 30(2): 338-54.

Bernstein, Shai, Rebecca Diamond, Timothy McQuade, and Beatriz Pousada. 2019. "The Contribution of High-Skilled Immigrants to Innovation in the United States." Stanford Graduate School of Business Working Paper 3748.

Blume-Kohout, Margaret. 2016. "Imported Entrepreneurs: Foreign-Born Scientists and Engineers in U.S. STEM Fields Entrepreneurship." U.S. Small Business Administration Report.

Borjas, George, and Kirk Doran. 2012. "The Collapse of the Soviet Union and the Productivity of American Mathematicians." *Quarterly Journal of Economics* 127(3): 1143-203.

Boucher, Anna. 2016. *Gender, Migration and the Global Race for Talent*. Manchester, UK: Manchester University Press.

Bound, John, Breno Braga, Gaurav Khanna, and Sarah Turner. 2016. "A Passage to America: University Funding and International Students." National Bureau of Economic Research Working Paper No. 22981.

Bound, John, Murat Demiric, Guarev Khanna, and Sarah Turner. 2015. "Finishing Degrees and Finding Jobs: U.S. Higher Education and the Flow of Foreign IT Workers." *Innovation Policy and the Economy* 15(1): 27-72.

Brown, J. David, John S. Earle, Mee Jung Kim, and Kyung Min Lee. 2019. "Immigrant Entrepreneurs and Innovation in the US High Tech Sector." Census Bureau Working Paper 19-06.

Brücker, Herbert, Stella Capuano, and Abdeslam Marfouk. 2013. "Education, Gender and International Migration: Insights from a Panel-Dataset 1980-2010." Working Paper.

Buchardi, Konrad B., Thomas Chaney, Tarek A. Hassan, Lisa Tarquinio, and Stephen J. Terry. 2019. "Immigration, Innovation, and Growth." Working Paper.

Carlino, Gerald, and William Kerr. 2015. "Agglomeration and Innovation." Vol. 5, in *Handbook of Regional and Urban Economics*, edited by Gilles Duranton, J. Duranton Henderson and William Strange, 349-404. Oxford, U.K.: North-Holland.

Clemens, Michael. 2013. "Why Do Programmers Earn More in Houston than Hyderabad? Evidence from Randomized Processing of U.S. Visas." *American Economic Review Papers and Proceedings* 103(2): 198-202.

Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda. 2014. "The Role of Entrepreneurship in US Job Creation and Economic Dynamism." *Journal of Economic Perspectives* 28(3): 3-24.

Depew, Briggs, Peter Norlander, and Todd Sorensen. 2017. "Inter-Firm Mobility and Return Migration Patterns of Skilled Guest Workers." *Journal of Population Economics* 30(2): 681-721.

Dimmock, Stephen G., Jiekun Huang, and Scott J. Weisbenner. 2019. "Give Me Your Tired, Your Poor, Your High-Skilled Labor: H-1B Lottery Outcomes and Entrepreneurial Success." National Bureau of Economic Research Working Paper No. 26392

Docquier, Frédéric, B. Lindsay Lowell, and Abdeslam Marfouk. 2009. "A Gendered Assessment of Highly Skilled Emigration." *Population and Development Review* 35(2): 297-321.

Docquier, Frédéric, and Abdeslam Marfouk. 2006. "International Migration by Educational Attainment (1990-2000)." In *International Migration, Remittances, and the Brain Drain*, edited by Caglar Ozden and Maurice Schiff, 151-199. New York: Palgrave Macmillan.

Docquier, Frédéric, Abdeslam Marfouk, Sara Salomone, and Khalid Sekkat. 2012. "Are Skilled Women More Migratory than Skilled Men?" *World Development* 40(2): 251-65.

Docquier, Frédéric, Riccardo Turati, Jérôme Valette, and Chrysovalantis Vasilakis. 2020. "Birthplace Diversity and Economic Growth: Evidence from the US States in the Post-World War II Period." *Journal of Economic Geography* 20(20): 321-354.

Doran, Kirk, Alex Gelber, and Adam Isen. 2015. "The Effects of High-Skilled Immigration Policy on Firms: Evidence from Visa Lotteries." National Bureau of Economic Research Working Paper 20668.

Doran, Kirk, and Chungeun Yoon. 2019. "Immigration and Invention: Evidence from the Quota Acts." Working Paper.

Dustmann, Christian, Francesco Fasani, Tommaso Frattini, Luigi Minale, and Uta Schoenberg. 2017. "On the Economics and Politics of Refugee Migration." *Economic Policy* 31(91): 497-550.

Fairlie, Robert W. 2012. "Immigrant Entrepreneurs and Small Business Owners, and their Access to Financial Capital." U.S. Small Business Administration Report.

Fairlie, Robert W. and Magnus Lofstrom. 2014. "Immigration and Entrepreneurship." In *Handbook on the Economics of International Migration*, edited by Barry R. Chiswick and Paul W. Miller. Oxford: North Holland.

Glaeser, Edward L., Sari Pekkala Kerr, and William R. Kerr. 2015. "Entrepreneurship and Urban Growth: An Empirical Assessment with Historical Mines." *Review of Economics and Statistics* 97(2): 498-520.

Glennon, Britta. 2019. "How Do Restrictions on High-Skilled Immigration Affect Offshoring? Evidence from the H-1B Program." Working Paper.

Gompers, Paul A., Vladimir Mukharlyamov, and Yuhai Xuan. 2016. "The Cost of Friendship." *Journal of Financial Economics* 119(3): 626-44.

Haltiwanger, John, Ron S. Jarmin, and Javier Miranda. 2013. "Who Creates Jobs? Small vs. Large vs. Young." *Review of Economics and Statistics* 95(2): 347-61.

Hanson, Gordon, and Chen Liu. 2018. "High-Skilled Immigration and the Comparative Advantage of Foreign Born Workers across U.S. Occupation." In *High-Skilled Migration to the United States and Its Economic Consequences*, edited by Gordon H. Hanson, William R. Kerr and Sarah Turner. Chicago: University of Chicago Press.

Hegde, Deepak and Justin Tumlinson. 2014. "Does Social Proximity Enhance Business Relationships? Theory and Evidence from Ethnicity's Role in US Venture Capital." *Management Science* 60(9): 2355-80.

Hira, Ron. 2010. "The H-1B and L-1 Visa Programs: Out of Control." EPI Briefing Paper 280, Washington, D.C.: Economic Policy Institute.

Hunt, Jennifer. 2017. "How Restricted is the Job Mobility of Skilled Temporary Work Visa Holders?" National Bureau of Economic Research Working Paper 23529.

———. 2015. "Are Immigrants the Most Skilled US Computer and Engineering Workers?" *Journal of Labor Economics* 33(S1): S39-77.

———. 2011. "Which Immigrants are Most Innovative and Entrepreneurial? Distinctions by Entry Visa." *Journal of Labor Economics* 29(3): 417-57.

Hunt, Jennifer, and Marjolaine Gauthier-Loiselle. 2010. "How Much Does Immigration Boost Innovation?" *American Economic Journal: Macroeconomics* 2(2): 31-56.

IOM, and OECD. 2014. "Harnessing Knowledge on the Migration of Highly Skilled Women." International Organization for Migration (IOM).

Jaschik, Scott. 2019. "Understanding the Decline in M.B.A. Applications." Inside Higher Ed. February 4, 2019. https://www.insidehighered.com/admissions/article/2019/02/04/new-data-help-explain-decline-mba-applications.

Kahn, Shulamit, and Megan MacGarvie. 2018. "The Impact of Permanent Residency Delays for STEM PhDs: Who leaves and Why." National Bureau of Economic Research Working Paper 25175.

———. 2017. "Misfits, Stars, and Immigrant Entrepreneurship." *Small Business Economics* 49(3): 533-57.

———. 2016. "How Important is U.S. Location for Research Science?" *Review of Economics and Statistics* 98(2): 397-414.

Kato, Takao, and Chad Sparber. 2013. "Quotas and Quality: The Effect of H-1B Restrictions on the Pool of Prospective Undergraduate Students from Abroad." *Review of Economics and Statistics* 95(1): 109-26.

Kerr, Sari Pekkala, and William R. Kerr. 2020a. "Immigrant Entrepreneurship in America: Evidence from the Survey of Business Owners 2007 & 2012." *Research Policy* 49(3): 103918.

———. 2020b. "Immigration Policy Levers for US Innovation and Startups." In *Innovation and Public Policy*, edited by Austan Goolsbee and Benjamin Jones. National Bureau of Economic Research: University of Chicago Press (forthcoming).

———. 2017. "Immigrant Entrepreneurship." In *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*, Vol. 75, edited by John Haltiwanger, Erik Hurst, Javier Miranda, and Antoinette Schoar. Studies in Income and Wealth (NBER). Chicago: University of Chicago Press.

Kerr, Sari Pekkala, William R. Kerr, and William Lincoln. 2015a. "Firms and the Economics of Skilled Migration." *Innovation Policy and the Economy* 15(1): 115-52.

———. 2015b. "Skilled Immigration and the Employment Structure of U.S. Firms." *Journal of Labor Economics* 33(S1): S109-45.

Kerr, Sari Pekkala, William R. Kerr, Çaglar Özden, and Christopher Parsons. 2017. "High-Skilled Migration and Agglomeration." *Annual Review of Economics* 9: 201-234.

———. 2016. "Global Talent Flows." *Journal of Economic Perspectives* 30(4): 83-106.

Kerr, William R. 2019a. *The Gift of Global Talent: How Migration Shapes Business, Economy & Society*. Stanford, CA: Stanford Business Books.

———. 2019b. "The Gift of Global Talent: Innovation Policy and the Economy." Ch. 1 in *Innovation Policy and the Economy*, Volume 20, edited by Josh Lerner and Scott Stern. Chicago: University of Chicago Press.

———. 2008. "The Ethnic Composition of U.S. Inventors." HBS Working Paper 08-006.

Kerr, William R. and William Lincoln. 2010. "The Supply Side of Innovation: H-1B Visa Reforms and U.S. Ethnic Invention." *Journal of Labor Economics* 28(3): 473-508.

Kofman, Eleonore. 2014. "Towards a Gendered Evaluation of (Highly) Skilled Immigration Policies in Europe." *International Migration* 52(3): 116-28.

Matloff, Norman. 2003. "On the Need for Reform of the H-1B Non-Immigrant Work Visa in Computer-Related Occupations." *University of Michigan Journal of Law Reform* 36(4): 815-914.

Mayda, Anna Maria, Francesc Ortega, Giovanni Peri, Kevin Shih, and Chad Sparber. 2018. "The Effect of the H-1B Quota on the Employment and Selection of Foreign-Born Labor." *European Economic Review* 108: 105-28.

Miguelez, Ernest and Carsten Fink. 2013. "Measuring the International Mobility of Inventors: A New Database." World Intellectual Property Organization Economic Research Working Paper 8.

Moser, Petra and Shmuel San. 2020. "Immigration, Science, and Invention. Evidence from the Quota Acts." Working Paper.

Moser, Petra, Alessandra Voena, and Fabian Waldinger. 2014. "German Jewish Émigrés and U.S. Invention." *American Economic Review* 104(10): 3222-55.

Nejad, Maryam Naghsh, and Andrew T. Young. 2014. "Female Brain Drains and Women's Rights Gaps: A Gravity Model Analysis of Bilateral Migration Flows." IZA Discussion Paper 8067.

Ottaviano, Gianmarco I.P., and Giovanni Peri. 2006. "The Economic Value of Cultural Diversity: Evidence from US Cities." *Journal of Economic Geography* 6(1): 9-44.

Pathak, Parag A., Alex Rees-Jones, and Tayfun Sönmez. 2020. "Immigration Lottery Design: Engineered and Coincidental Consequences of H-1b Reforms." National Bureau of Economic Research Working Paper 26767.

Partnership for a New American Economy. 2011. "The 'New American' Fortune 500." https://www.newamericaneconomy.org/sites/all/themes/pnae/img/new-american-fortune-500-june-2011.pdf.

Peri, Giovanni. 2012. "Rationalizing U.S. Immigration Policy: Reforms for Simplicity, Fairness, and Economic Growth." Brookings Report.

Peri, Giovanni, Kevin Shih, and Chad Sparber. 2015. "STEM Workers, H-1B Visas and Productivity in U.S. Cities." *Journal of Labor Economics* 33(S1): S225-55.

Porter, Michael E., Jan W. Rivkin, Mihir A. Desai, Katherine M. Gehl, William R. Kerr, and Manjari Raman. 2019. "A Recovery Squandered: The State of U.S. Competitiveness 2019." Harvard Business School. https://www.hbs.edu/competitiveness/Documents/a-recovery-squandered.pdf.

Roach, Michael, Henry Sauermann, and John Skrentny. 2019. "Entrepreneurial Characteristics, Preferences and Outcomes of Native and Foreign Science & Engineering PhD Students." In *The Role of Immigrants and Foreign Students in Science, Innovation, and Entrepreneurship*, Edited by Ina Ganguli, Shulamit Kahn, and Megan MacGarvie. Chicago: University of Chicago Press, forthcoming.

Roach, Michael, and John Skrentny. 2019. "Why Foreign STEM PhDs are Unlikely to Work for U.S. Technology Startups." *Proceedings of the National Academy of Sciences* 116(34): 16805-10.

Ruiz, Neil, and Jens Manuel Krogstad. 2017. "Salaries Have Risen for High-Skilled Foreign Workers in U.S. on H-1B Visas." *FactTank* (blog), Pew Research Center, August 16, 2017, http:// www .pewresearch .org/ fact-tank/2017/08/16/salaries-have-risen-for-high-skilled-foreign-workers-in-u-s-on-h-1b -visas/.

Ruggles, Steven, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas, and Matthew Sobek. 2019. "IPUMS USA: Version 9.0 dataset." Minneapolis, MN. doi:https://doi.org/10.18128/D010.V9.0.

Ruyssen, Ilse, and Sara Salomone. 2018. "Female Migration: A Way out of Discrimination?" *Journal of Development Economics* 130(1): 224–41.

Saxenian, AnnaLee. 2002. "Silicon Valley's New Immigrant High-Growth Entrepreneurs." *Economic Development Quarterly* 16: 20-31.

———. (1999). "Silicon Valley's New Immigrant Entrepreneurs." San Francisco: Public Policy Institute of California.

Sparber, Chad. 2018. "Choosing Skilled Foreign-Born Workers: Evaluating Alternative Methods for Allocating H-1B Work Permits." *Industrial Relations* 57(1): 3-34.

Stangler, Dane, and Jared Konczal. 2013. "Give Me Your Entrepreneurs, Your Innovators: Estimating Employment Impact of a Startup Visa." Ewing Marion Kauffman Foundation.

Stephan, Paula E., and Sharon G. Levin. 2001. "Exceptional Contributions to US Science by the Foreign-Born and Foreign-Educated." *Population Research and Policy Review* 20(1): 59-79.

UN DESA. 2019. "International Migrant Stock 2019: Country Profiles." United Nations, Department of Economic and Social Affairs, International Migration, Population Division. 2019.

https://www.un.org/en/development/desa/population/migration/data/estimates2/countryprofiles.asp.

U.S. Department of State. 2019. "Nonimmigrant Visa Statistics." https://travel.state.gov/content/travel/en/legal/visa-law0/visa-statistics/nonimmigrant-visa-statistics.html

USCIS. 2018. "Number and Characteristics of F-1 Beneficiaries Who Changed Status to H-1B: Fiscal Years 2012-2018 (to date)."

———. 2019. "Characteristics of H-1B Specialty Occupation Workers."

Wadhwa, Vivek, Ben Rissing, AnnaLee Saxenian, and Gary Gereffi. 2007. "Education, Entrepreneurship and Immigration: America's New Immigrant Entrepreneurs, Part II." Kauffman Foundation Report.

Wadhwa, Vivek, Guillermina Jasso, Ben Rissing, Gary Gereffi, and Richard Freeman. 2007. "Intellectual Property, the Immigration Backlog, and a Reverse Brain-Drain: America's New Immigrant Entrepreneurs, Part III." Kauffman Foundation Report.

World Bank. 2017. Open Data (https://data.worldbank.org/indicator/SM.POP.NETM).