



U.S. Visa and Immigration Policy Challenges: Explanations for Faculty Perceptions and Intent to Leave

Mary K. Feeney¹ · Heyjie Jung^{2,4} · Timothy P. Johnson³ · Eric W. Welch²

Received: 22 July 2021 / Accepted: 16 February 2023 / Published online: 6 March 2023
© The Author(s), under exclusive licence to Springer Nature B.V. 2023

Abstract

United States (US) immigration policies have increasingly focused on national security resulting in universities experiencing declines in international student applications, constraints on international scholar employment, and complications facilitating international research collaborations. The COVID-19 pandemic brought additional travel restrictions, embassy closures, and health and safety concerns that exacerbated these challenges. Science mobility is critical for science education, training, competitiveness, and innovation. Using a representative sample of US and foreign-born scientists in three STEM fields, we explore how recent visa and immigration policies have shaped research collaborations, work with students and postdoctoral scholars, and intentions to leave. We use descriptive statistics, analysis of variance, and logistic regression and find academic scientists report disruptions from visa and immigration policies; negative impacts of immigration policies on US higher education; negative effects on recruitment and retention of international trainees; and increased intentions to leave the US driven by negative perceptions of immigration policy.

Keywords Higher education · Visas · Immigration · Foreign-born scientists · COVID-19 · STEM faculty

✉ Mary K. Feeney
mkfeeney@asu.edu

Heyjie Jung
heyjie.jung@ou.edu

Timothy P. Johnson
timj@uic.edu

Eric W. Welch
EricWelch@asu.edu

¹ Arizona State University, Phoenix, AZ, USA

² Center for Science, Technology and Environmental Policy Studies, Arizona State University, Phoenix, USA

³ University of Illinois at Chicago, Chicago, USA

⁴ Department of Political Science, University of Oklahoma, Norman, USA

Introduction

It is widely accepted that migration and international movement of scholars and scientists creates positive outcomes for national economies and the science and technology enterprise. Research across the world indicates that international mobility among science students and faculty increases the dissemination of knowledge, resource flow (Toren, 1996), and the production of science, medicine, and engineering (Nerdrum & Sarpebakken, 2006). Nowhere is this reliance on international scholarship more valued than in the US scientific enterprise, a system that has long touted the value of investing in science, technology, engineering, and mathematics (STEM) fields and welcoming scientists from around the world to advance US research, innovation, and economic development. Yet, this reputation and culture has been shifting as the US immigration system becomes more focused on national security and international scholars face increased social hostility and bureaucratic barriers to living in the US (Gopal, 2016; Kim et al., 2018; Sabharwal & Varma, 2017). These changes in US immigration policy are occurring at the same time that global competition for scientific human capital has increased international academic career opportunities (Altbach, 2005) and more foreign-born scientists and engineers are returning to their home countries because of improved employment, research, and career opportunities (Sabharwal & Varma).

The US has a history of welcoming and relying on foreign-born scientists, from German scientists fleeing World War II, Russian and Eastern European scientists during and after the Cold War, to scientists from East and South Asia seeking educational and employment opportunities. International scholars offer vital human capital to American universities, through diversity of ideas and campus life, international networks, scientific production, and the recruitment and training of students (Corley & Sabharwal, 2007; Kim et al., 2012; Mamiseishvili, 2013; Mamiseishvili & Lee, 2018; Mamiseishvili & Rosser, 2010; Slaughter, 2014). In more recent decades, as US universities find themselves under state and federal funding constraints, they have sought to supplement their budgets by recruiting more international students who typically pay higher tuition rates (Banks & Bhandari, 2012; Gopal, 2016). Today, foreign-born faculty make up 29% of full-time STEM faculty and foreign-born students account for about 41% of undergraduate students and approximately 63% of graduate students in STEM fields (National Science Board, 2014, 2020). Foreign-born scientists bring resources, knowledge, and value to the US higher education system. While the US higher education system has long enjoyed the benefits of its strong reputation for welcoming foreign students and faculty and producing top science, recent shifts in global politics and US immigration policy have added barriers to the recruitment and retention of foreign-born scientists. Growing anti-immigrant sentiments, travel bans, and immigration policies during the Trump administration exacerbated these challenges. In March 2020, the COVID-19 pandemic limiting travel affected domestic and international scientists travel, mentoring, and recruitment efforts, while highlighting the poor health care system and political strife in the US. These US policies have been implemented at a time when the scientific workforce at all career stages is more globally mobile (Moed et al., 2013), competition for international scientific talent is rising (Hazelkorn, 2015), and international collaboration teams are common (Gazni et al., 2012). Additionally, countries in Europe and Asia have implemented policies to better facilitate the return and reintegration of scientists (Cañibano et al., 2008; van Holm et al., 2019) and their universities have become more competitive and attractive to scholars (Freeman, 2010). These push and pull

factors inevitably shape the opportunities, strategies, and intentions of individual scientists, which ultimately affect the diversity and quality of the US academic workplace.

In this paper, we present recent data on academic scientists' perceptions about immigration and visa challenges in the US. We draw from a representative sample of US-born and foreign-born scientists in biology, civil and environmental engineering, and geography at research extensive universities across the US. We ask the following research questions:

- (1) What are US academic scientists' experiences with and perceptions of visa and immigration policies given recent political rhetoric, immigration policy changes, and the COVID-19 pandemic?
- (2) What are academic scientists' experiences working with international students and postdocs as related to visa and immigration issues?
- (3) What are academic scientists' intentions to leave the US and are those intentions related to field of study, citizenship status, and workplace perceptions?

Next, we review the literature on international diversity and push–pull factors in US higher education. In Sect. “[Material and Methods](#)”, we describe our survey, sample, and data collection methods. In Sect. “[Results](#)”, we present our findings. We conclude with a discussion of what the findings mean for academic scientists, higher education policy, and US STEM diversity and competitiveness.

International Faculty and Students in STEM at US Universities

Academic STEM

US higher education institutions attract talented students and faculty from around the world. The US has maintained its reputation as a rich research environment, that supports generous investment in research infrastructure (Stephan et al., 2013; Trapani & Gibbons, 2020) and a competitive STEM job market (Gandhi-Lee et al., 2017). US-based academic science relies on international collaborators, colleagues, faculty, and students as critical drivers of the US innovation and competitiveness (Gandhi-Lee et al., 2017; Kerr & Lincoln, 2010; Roach & Skrentny, 2019; Stephan & Levin, 2003; Welch et al., 2018). International scholars help the US higher education system maintain its global competitive position. Foreign-born academic scientists bring multiple resources critical for the health and well-being of university communities and sustained scientific leadership (Kim et al., 2012). They recruit high-quality colleagues and provide access to international opportunities for both US and international students through professional networks in their home countries (Altbach & Balán, 2007; Foote et al., 2008; Kim et al., 2011, 2012; Mamiseishvili, 2013; Sun & Bian, 2012). Additionally, communities of international scholars provide important social support to newly arriving students and faculty (Gahungu, 2011). Yet, foreign-born scientists' career prospects are contingent on immigration and visa policies. For example, recent visa delays have decreased stay rates for Indian and Chinese PhD holders who make up a large proportion of foreign-born STEM graduate students in the US (Kahn & MacGarvie, 2020). These delays directly affect the research trajectories of domestic and foreign-born STEM faculty and the competitiveness of US science.

International collaboration and travel are both common and critical to advancing science and innovation (Ackers, 2005; Freeman et al., 2015; Wagner & Leydesdorff, 2005; Wagner

et al., 2017). Foreign-born faculty are more likely than US-born scientists to collaborate with colleagues abroad and to travel for research (Finkelstein et al., 2009; Stephan & Levin, 2000; Stephan et al., 2013; Welch et al., 2018). International scientists transfer their experience, knowledge, and networks expanding science collaborations, knowledge, and available resources benefitting less mobile scientists in the US institutions (Bratti & Conti, 2018; Schiller & Diez, 2008; Siekierski et al., 2018). Domestic scientists who do not travel or work abroad also experience the effects of visa and immigration policies through their students and collaborators. The international nature of science networks and global knowledge flows (Franzoni et al., 2014; Gibson & McKenzie, 2014; Welch et al., 2018) make visa and immigration issues pertinent for most faculty at US higher education institutions.

Universities play a critical role in attracting and retaining international talent to the STEM workforce and provide extensive, costly, time-consuming services to assist students coming to the US on visas (typically the F-1). While visas bring talented science students to the US, there is not a guaranteed path from student visa to permanent residency. Upon graduation (and expiration of the F-1), international students must either leave the US or secure an H1-B work visa, a highly competitive process for which there are yearly quotas (Gopal, 2016). Many universities work to transition foreign-born scientists from student visas to work visas, but doing so is complicated and costly for employers (Gopal, 2016). Consequently, many scientists and engineers report returning to their home countries because of immigration challenges (Sabharwal & Varma, 2017).

While universities provide invaluable legal and financial support to faculty on work visas (typically H1-B) or who are navigating the citizenship process, foreign-born academic scientists regularly report hurdles and extensive bureaucratic barriers to staying and working in the US or returning to their home countries for visits (Bookman, 2020; Gopal, 2016). Researchers note that since the 1990s there has been an increasing shift toward foreign-born scientists and engineers leaving the US after receiving their training due to improved employment opportunities in their home countries and US immigration challenges (Marini & Yang, 2021; Varma & Kapur, 2013; Wadhwa & Salkever, 2012). There have long been calls to streamline the US visa and immigration system, to enhance employment in STEM fields (Harris, 2014; Teich, 2014), and to make it easier for universities to attract top students and faculty, yet universities continue to have little input to immigration policy (Gopal & Streitwieser, 2016).

Political Change, COVID-19, and Academic Mobility

In response to the terrorist attacks of 9/11, increased globalization and migration of workers, and nationalistic political trends, the US has experienced a shift away from liberal policies toward immigration to focus more on border security and immigration restrictions. Visa and immigration policy changes following the 9/11 attacks, in particular the Student and Exchange Visitor Information System (SEVIS), reduced international student enrollment, marking the first declines in over 30 years (Bollag, 2004; Guruz, 2011). Universities have long benefited from preferential treatment in the US visa and immigration system, since they typically attract those focused on STEM fields who can participate in two-step migration, first as a student and then as a permanent resident, worker, and eventually citizen (Hawthorne, 2012). But this benefit to universities was curbed when SEVIS ensured national security concerns would take precedence over educational missions.

Following the 2016 election of Donald Trump, the pressure on international scholars in the US intensified. The Trump administration used strong political language advocating for less immigration and stronger borders. For example, in 2018 the administration created a “National Vetting Center” to increase efforts for extreme vetting of individuals who might pose a national security threat (Trump, 2018). They also singled out particular nations and religious groups. In January 2017, Trump issued the first of three “Muslim Bans” or travel bans applying to six Muslim majority countries—Iran, Libya, Sudan, Somalia, Yemen, and Syria—which had an immediate impact on university hiring and student enrollments (Jackson, 2017; Wadhia, 2018). The Department of Justice’s 2018 “China Initiative”, aimed at countering Chinese national security threats including trade secret theft, hacking, and espionage, resulted in racial profiling and threats to academic freedom of Chinese born academic scientists (Kania & McReynolds, 2021). The Trump administration also initiated numerous discussions to limit or end the H1-B visa program and in June 2020 issued an executive order suspending H1-B, H2-B, J and L visa programs (AB Wire, 2020), the primary mechanisms for international scientists to work and for international STEM graduates to stay in the US. Shifts in US immigration policy toward national security and border control coupled with executive orders that targeted particular populations threatened the flow of international scientists to US universities and increased uncertainty and administrative burdens for international applicants.

Changes in visa policies or uncertainty about potential changes greatly impact student enrollments. For example, the SEVIS changes to student visa regulations and processing times coupled with poor treatment of applicants resulted in a stark decline of male international students from the Middle East coming to the US (Danley, 2010). In a comparison of international student mobility across the UK, Australia, Canada, and the US, Gopal (2016) found that the ease by which student visas can be obtained is a primary predictor of international student enrollments. These shifts in US immigration policy since 9/11 have slowed what was historically a successful inflow of international students to the US. Gopal (2016) notes that declines in international student movement to the US have been picked up by Canada and Australia, countries that have adopted more open and less bureaucratic visa systems for students with options for permanent residency after graduation and China has become the third largest destination for foreign students in 2016 (Lu, 2019).

These changes in policies and attitudes are also affecting the recruitment and retention of international faculty at US universities. Faculty mobility is shaped by a number of factors including ease of movement (e.g. opportunities for new jobs, family constraints), job satisfaction, and productivity (Kim et al., 2020; Rosser, 2004). Recent qualitative research indicates that foreign-born faculty are reporting increased levels of concern about the rise of racism and xenophobia and the unpredictability of immigration policies in the US (Bookman, 2020). One interviewee noted that these concerns have led her to consider “leaving the US if Trumpism continues” (Bookman, 2020 p. 59). Another faculty member noted considering moving to Canada, which is more open to immigrants. Qualitative research indicates uncertainty, increased administrative burden, and fears related to racism are leading faculty to consider leaving the US (Bookman, 2020) but we have less knowledge about how these changes are affecting domestic faculty, US university competitiveness, and the scientific enterprise.

In addition to shifts in immigration policy and culture from one of welcoming immigrants to a less friendly national security effort, the 2020 COVID-19 outbreak and subsequent policies requiring social distancing, travel bans, and closures of universities and government offices leveled another threat and complication to international and domestic academic sciences. Universities closed in-person activities and sent people home to

work remotely and government offices (e.g. US embassies) limited, temporarily suspended, or ceased altogether in-person visits and routine visa services (US Department of State & Bureau of Consular Affairs 2020). Border closures and travel restrictions immediately affected travel for domestic and international scientists, university admissions, and the ability of scientists to visit their home countries, collect data, or return to the US.

In addition to embassy closures and visa processing delays, some international students and faculty living in the US experienced hostility based on their national origin. This hostility has been especially harsh against Chinese nationals and other Asians and Asian descendants in the US (Makalintal, 2021). The US response to COVID-19 not only complicated visa and immigration processing for international scientists, but it accentuated major social and cultural problems in the US including racial conflict and discrimination, poor health care systems, and inadequate social safety nets for childcare, unemployment, and housing. International scholars found themselves victims of racial violence and threats, unsure about the safety of their families, and managing increased stress with little institutional support (Johnson et al., 2021). These negative experiences shape the perceptions of both international and domestic scientists and are likely to shape short-term and long-term behavior in the US science enterprise.

Research Questions

- (1) What are academic scientists' experiences with and perceptions of visa and immigration policies given recent political rhetoric, immigration policy changes and COVID-19 pandemic?
- (2) What are academic scientists' experiences working with international students and postdocs as related to visa and immigration issues?
- (3) What are scientists' intentions to leave the US and are those intentions related to field of study, citizenship status and workplace perceptions?

Material and Methods

Data Collection

This paper uses online survey data collected October through November 2020 by the ASU Center for Science, Technology, and Environmental Policy Studies, SciOPS team (www.sci-ops.org). In this section, we describe the sample design and survey development and implementation. The population is a random sample of academic scientists (tenured, tenure-track, and non-tenure-track) who work in three disciplines (biology, civil and environmental engineering, and geography). These scientists work at 60 randomly selected universities classified as Carnegie designated research extensive (R1) universities (drawn from the most recent Carnegie listings). We geographically stratified the full list of research extensive institutions by the eight region Carnegie classification and did random proportionate sampling from each region to account for regional differences. For each selected university, we developed a list of all tenure, tenure-track, and non-tenure track faculty in biology,

civil and environmental engineering, and geography. The final sample was randomly selected from these lists and includes US born and foreign-born scientists. The research team developed the survey in October 2020. The questionnaire included sections about the impacts of current US visa and immigration policies on scientific research and collaboration, the higher education system, and policy objectives over the past 12 months. All respondents (US-born and foreign-born) were asked the same questions. The instrument was electronically programmed in English using the Sawtooth Software ® system. The survey was approved by Institutional Review Boards at Arizona State University and the University of Illinois at Chicago.

A total of 2443 scientists were invited to participate in the survey via email invitations with a series of personalized email follow-up reminders. Survey invitations with a unique ID, passwords, and hyperlink to the survey were sent on October 22 and 23, 2020 followed by three reminder messages. The survey was closed on November 23, 2020. 419 usable responses including 48 partial responses were collected representing an AAPOR response rate (RR4) of 17.4%. Poststratification weights were applied for gender and academic field to represent the population as closely as possible. The measure of sampling error for questions answered by the full sample is plus or minus 5 percentage points. In this analysis, we use the 371 complete responses.

Data Description

Table 1 reports the demographic characteristics of survey respondents. Among faculty surveyed, 42% are full professors, most work in biology departments (72%), and about

Table 1 Descriptive characteristics of survey respondents

	N	Percentage
Rank		
Assistant professor	97	26
Associate professor	77	21
Full professor	157	42
Non-tenure track faculty	40	11
Field		
Biology	268	72
Civil and Environment Engineering	71	19
Geography	32	9
Gender		
Male	252	68
Female	119	32
Citizenship status		
Native born US citizen	198	54
Naturalized US citizen	91	25
Non-US citizen with a permanent US resident visa	57	15
Non-US citizen with a temporary US resident visa	24	6
Total		
Completed survey response	371	

two-thirds (68%) are male. Slightly more than half are US-born citizens (54%). About 21% of respondents are non-US citizens with either permanent or temporary US resident visas.

For the logistic regression model, we use the dependent variable, *Intention to Leave the US*, a binary variable drawn from the questionnaire item: “In the past 12 months, have you seriously considered moving to another country?” (1 = yes; 0 = no).

We include four indexed measures of the following faculty perceptions: (1) positive visa and policy outcomes, (2) negative visa and policy outcomes, (3) student and faculty mobility, and (4) impacts of visa and immigration policies on US higher education. To capture specific perceptions of Trump administration policies, we asked respondents: “The Trump Administration has proposed a number of changes to the US visa and immigration system. To what extent do you think these potential changes will contribute toward achieving each of the following policy objectives?” Respondents were presented with 10 items with a 3-point response scale. Table 2 shows the principal component analysis results that loaded into two components: Positive Policy Outcomes and Negative Policy Outcomes. *Positive Policy Outcomes* is an average of the responses to seven questionnaire items; the Cronbach’s alpha is 0.85. *Negative Policy Outcomes* is the average of responses from three questionnaire items; the Cronbach’s alpha is 0.61. A higher score indicates a perception that immigration policy has major positive or negative outcomes.

Perceived Mobility is an averaged scale from responses to four items. The survey asked: “In your opinion, to what extent have US visa and immigration policies increased or

Table 2 Principal component analysis results on faculty perception of policy outcomes

Component	Positive policy outcomes	Negative policy outcomes
Increasing economic fairness and opportunity	0.867	– 0.032
Building a skilled labor supply	0.796	– 0.023
Safeguarding national security	0.740	– 0.049
Protecting jobs for Americans	0.720	– 0.006
Protecting university intellectual property	0.681	– 0.070
Ensuring public health	0.655	0.074
Increasing international understanding	0.638	0.063
Distrust of foreign governments	– 0.101	0.853
Penalizing particular countries or nationalities	– 0.061	0.816
Minimizing racial, cultural and religious diversity	0.103	0.547
Eigenvalue	3.792	1.715
Cronbach’s Alpha	0.85	0.610

Bold indicates factor loadings

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization

Questionnaire Item: The Trump Administration has proposed a number of changes to the US visa and immigration system. To what extent do you think these potential changes will contribute toward achieving each of the following policy objectives? Response Categories: 1 = no contribution, 2 = minor contribution, 3 = major contribution

decreased the following?” (1) International scholars seeking employment outside the US, (2) US faculty seeking employment outside the US, (3) International student preference to work outside the US after graduation, and (4) International student applications to study in US institutions. The resulting scale has a Cronbach’s alpha of 0.62 and ranges from 1 to 5 with a higher score indicating perceptions of greater mobility.

Perceived impacts on higher education measures faculty perceptions of the impacts of recent visa and immigration policies on dimensions of US higher education. The variable is constructed by averaging responses to nine items (see Fig. 2 or Appendix A). The resulting scale has a Cronbach’s alpha of 0.94 and ranges from 1 to 5. A higher score indicates more positive effects.

We include the following individual level measures: self-reported citizenship status, gender, academic rank, and field of science. We include the following controls for university characteristics: region, proportion of faculty of color, and faculty citizenship composition, which come from the Integrated Postsecondary Education Data System (IPEDS). All questionnaire items and descriptive statistics are listed in Appendix A.

Method for Analysis

We report descriptive statistics to investigate how academic scientists experience recent visa and immigration issues in the US. We conduct a series of one-way analysis of variance (ANOVA) models and crosstabs to examine variation between US citizens and non-US citizens and a logistic regression model investigating the determinants of intention to leave the US.

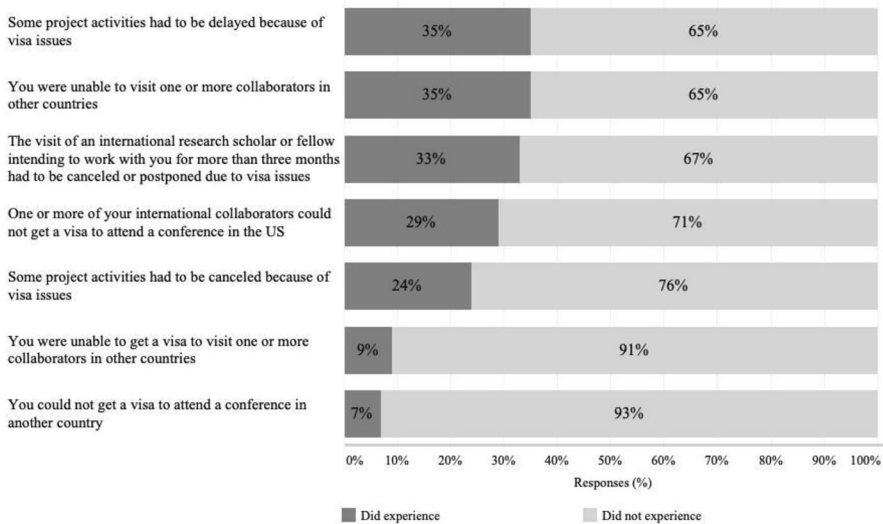


Fig. 1 Faculty experiences due to current US visa and immigration policies (n = 368)

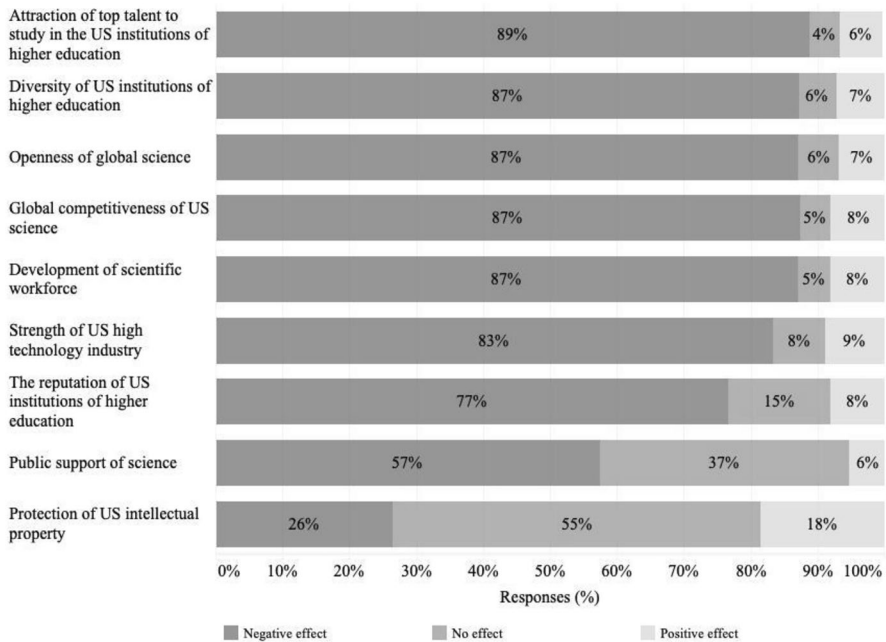


Fig. 2 Faculty perceptions of the impacts of current US and immigration policies on higher education (N = 362)

Results

Scientists' Experiences and Perceptions of US Visa and Immigration Policy

Visa and Immigration Issues Related to Research and Collaboration

Figure 1 illustrates faculty responses to questions regarding how visa and immigration issues have affected their research and collaborations in the previous year. These responses inevitably capture visa and immigration experiences shaped by COVID-19 responses. More than one third of respondents (35%) experienced some delays in their projects because of visa issues and were unable to visit their collaborators in other countries. About one third indicated that their international collaborators' visits were canceled or postponed due to visa problems. Approximately 24% had to cancel their projects because of visa issues.

Visa and Immigration Issues Related to Higher Education

Figure 2 illustrates how faculty perceive the effects of current US immigration and visa policies on various dimensions of the US higher education system. Respondents indicated if they believe US immigration policies have positive, negative, or no effect on student recruitment, global competitiveness, and the reputation of US higher education. They overwhelmingly reported negative effects. More than 80% indicated

that current immigration policies have a negative impact on the attraction of top talent to study at US institutions of higher education (89%), diversity in US higher education (87%), competitiveness and openness of global science (87%), development of the scientific workforce (87%), and strength of the US high tech industry (83%). The most positive effect scientists reported from current immigration policies is protection of US intellectual property (18%), though a larger proportion of respondents reported negative effects related to protecting intellectual property (26%).

Visa and Immigration Issues Related to International Students and Postdocs

Hiring and Mentoring International Students and Postdocs

International students make up a large contingent of trainees in the US. More than half reported employing international students as research or teaching assistants (53%) and about one third employed international postdocs (32%) in the last 12 months. Around half reported mentoring international students who do not necessarily work on research with them (52%) and working on research with international students they did not directly employ (48%). These reports indicate the important role international postdocs and students play as both employees and collaborators.

Figure 3 shows faculty experiences with student and postdoctoral visa and immigration issues. Nearly three-quarters of respondents (72%) said that international students and postdocs they work with could not return home because of visa and immigration issues. Approximately 42% also reported that their international students and postdocs could not get a visa to enter or return to the US. More than half of the respondents (54%) reported they lost international students and postdocs they had recruited and 45% indicated they could not hire new students or postdocs. These reports indicate a clear disruption to US-based scientists working with international trainees.

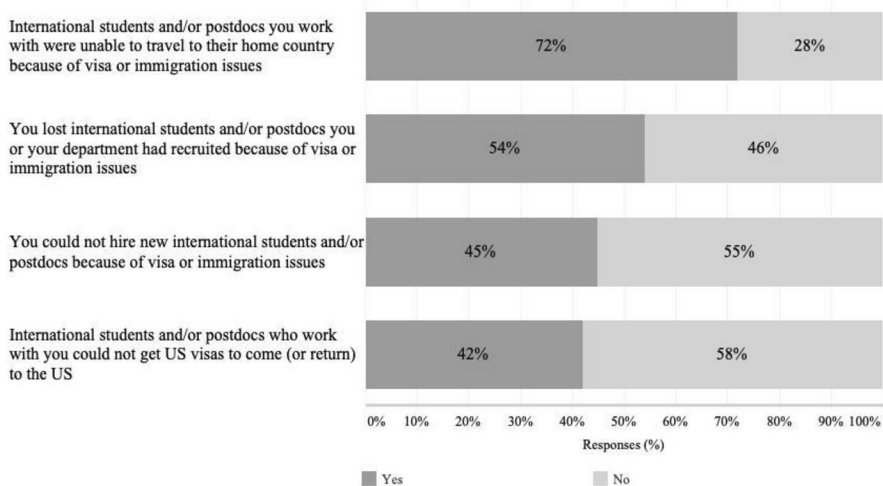
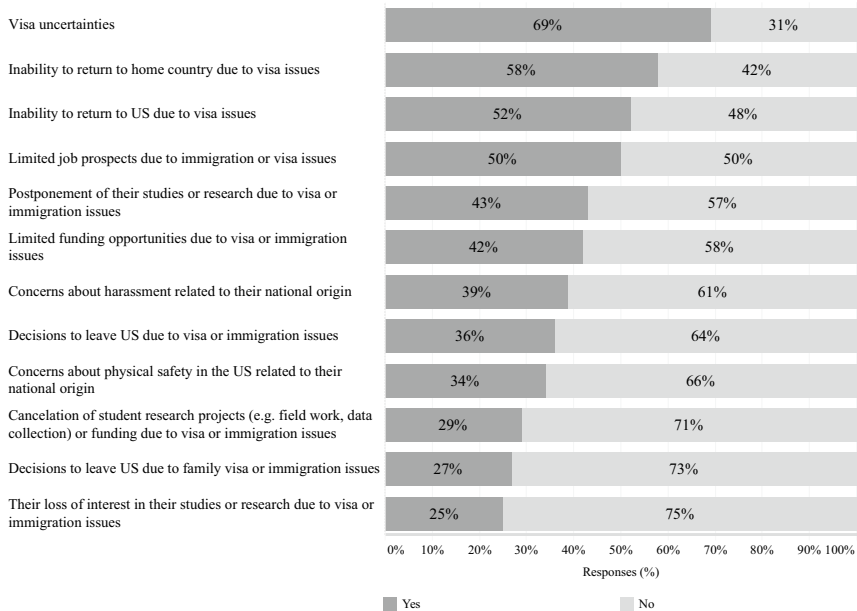


Fig. 3 Faculty experience hiring and working with international students and postdocs in last 12 months (N=371)

Table 3 Faculty engagement with international students in the last 12 months (N=285)

	Yes	No
Maintain regular or one-on-one meetings	236 (83%)	48 (17%)
Host group, research, or lab meetings so students can maintain a sense of community	222 (78%)	62 (22%)
Schedule regular updates and outline communication expectations	219 (77%)	66 (23%)
Discuss employment concerns	217 (76%)	68 (24%)
Discuss financial concerns	174 (61%)	111 (39%)
Provide information regarding mental and health resources	147 (52%)	136 (48%)
Encourage student to do counseling sessions	123 (43%)	162 (57%)

**Fig. 4** Visa and immigration related topics discussed with international students and postdocs in last 12 months (N=371)

We also asked faculty how they have been engaging, supporting, and mentoring their international students during the last 12 months. Table 3 shows that keeping regular or one-on-one meetings (83%), hosting meetings to keep a sense of community (78%), organizing regular updates and setting communication expectations (77%), and by discussing employment concerns (76%) are the most common ways faculty report engaging their international students.

Figure 4 shows the topics related to visa and immigration discussed by faculty with international students and postdocs during the last 12 months. One of the most common topics discussed was uncertainties regarding visas (69%). More than half of faculty reported discussing inability to travel to home countries (58%) and returning to the US (52%) with their trainees. Faculty also reported discussing limited job opportunities (50%), delays in studies or research (43%), limited funding opportunities (42%), and concerns about harassment (39%) and physical safety in the US due to national origin (34%). Over one quarter (27%) reported they discussed the student or postdoc leaving the US because of family visa and immigration issues.

Impacts of Visa and Immigration Issues on Mobility

Work and Study Mobility Preferences

Figure 5 illustrates scientist perceptions of the impacts of visa and immigration policies on preferences to study and work in the US. The majority of respondents (90%) regardless of their citizenship status reported that preferences among international students to study in the US have decreased (either a lot or some). Around three quarters of US citizens (73%) and non-citizens with permanent visas (75%) and nearly all non-citizens with temporary visas (95%) reported that international students’ interest in working in other countries has increased (either a lot or some). More than half of the

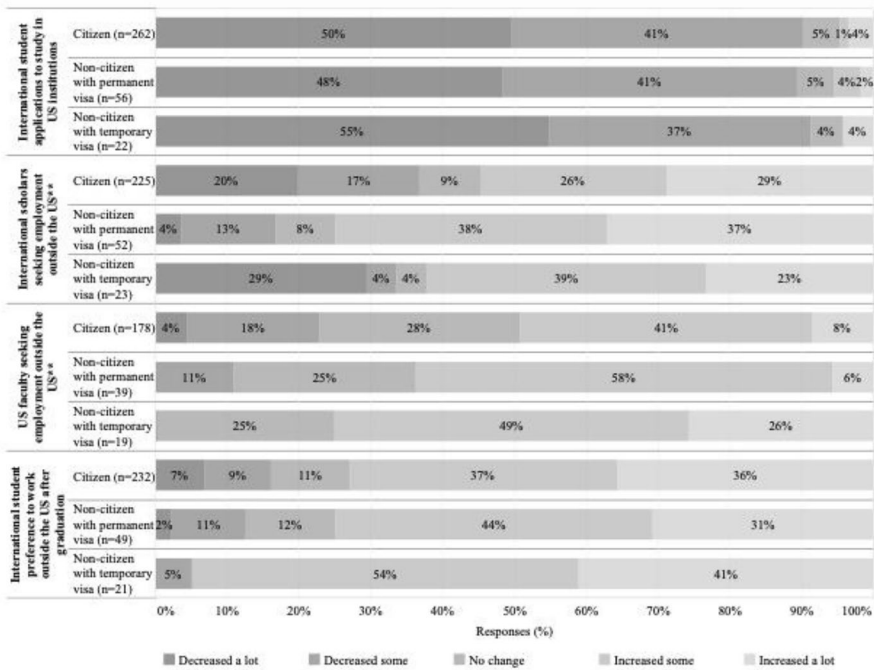


Fig. 5 Faculty perceptions on the impacts of US visa and immigration policies on work/study preferences among students and faculty (N=343). Test for difference based on chi-square test. *** p<0.01; ** p<0.05; * p<0.10

scientists who are US citizens (55%) indicated international scholars are increasingly seeking employment outside the US; a higher proportion of non-US citizen faculty with permanent visas (75%) and temporary visas (62%) reported the same. The difference is statistically significant (Pearson $\chi^2 = 15.58$, $p = 0.049$). About half of US citizens (49%) reported US faculty are increasingly seeking work opportunities outside the US, while about 64% of non-citizens with permanent visas and 75% of non-citizens with temporary visas reported the same. This difference is also statistically significant (Pearson $\chi^2 = 16.64$, $p = 0.034$).

Intention to Leave the US

We asked respondents if they have considered moving to another country over the last 12 months, which spanned the 1st year of COVID-19. About 37% of the respondents ($n = 137$) indicated they have considered leaving the US. An ANOVA reveals non-US citizens with temporary visas (63%) are significantly more likely than US citizens (35%) to report intentions to leave the US (Pearson $\chi^2 = 7.47$, $p = 0.024$).

Motivations for Considering Leaving the US

We asked those who indicated considering leaving about the major and minor reasons for their intentions. Figure 6 illustrates these reasons, by citizenship status. A similar proportion of US citizens (89%), non-US citizens with permanent residency (89%), and non-US citizens with temporary visas (93%) report no longer feeling welcomed in the US

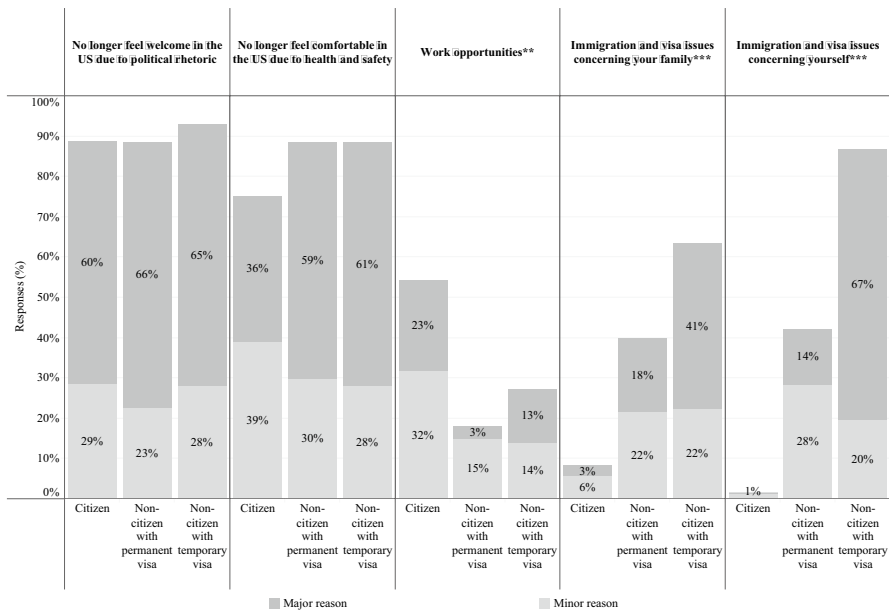


Fig. 6 Percent of faculty who identified major and minor reasons for their intention to move to another country, by citizenship status (N = 134) Test for difference based on chi-square test. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

because of political rhetoric. Around 60% of non-US citizens cite health and safety issues in the US as a major reason to move, while about 36% of US citizens mentioned health and safety issues as a major reason to move. Figure 6 shows there are significant differences in intention motivations by citizenship status. First, there is a significant difference in reporting work opportunities as a reason for intention to leave the US (Pearson $\chi^2=11.58$, $p=0.021$). Significantly more US citizens (55%) report work opportunities abroad (a pull factor) as a major or minor reason to move, compared to non-US citizens with permanent (18%) and temporary visas (27%). Second, Non-US citizens report that immigration and visa issues regarding their family (permanent visa holders (40%), temporary visa holders (63%)) (Pearson $\chi^2=35.81$, $p<0.001$) and themselves (permanent visa holders (42%), temporary visa holders (87%)) (Pearson $\chi^2=92.55$, $p<0.001$) are major reasons for their intentions to leave the US. In sum, while all respondents report political rhetoric as a major reason for intention to leave, US citizens are significantly more likely to report work opportunities as a second reason to leave while non-US citizens’ intentions to leave are

Table 4 Logistic regression predicting intention to leave the US

	Estimate	Std. Error	P-value
(Intercept)	0.08	1.20	0.95
Respondent perceptions			
Perceived positive policy outcomes	− 0.70	0.52	0.17
Perceived negative policy outcomes	0.25	0.21	0.23
Perceived mobility	0.25	0.14	0.08
Perceived impacts on higher education	− 0.57	0.20	0.00
Respondent characteristics			
Female	− 0.09	0.27	0.75
Non-U.S. citizen with a permanent U.S. resident visa	0.13	0.34	0.72
Non-U.S. citizen with a temporary U.S. resident visa	1.23	0.54	0.02
Associate professor	− 0.35	0.34	0.30
Full professor	− 0.80	0.31	0.01
Civil engineering	0.34	0.33	0.31
Geology	− 0.17	0.44	0.69
University characteristics			
University % non-US resident faculty	− 3.76	4.31	0.38
University % faculty of color	0.66	2.66	0.80
Great Lakes	− 0.05	0.53	0.93
Mid-East	0.16	0.53	0.77
New England	2.15	0.66	0.00
Plains	0.51	0.58	0.38
Rocky Mountains	− 0.44	1.07	0.68
Southeast	0.37	0.48	0.45
Southwest	0.06	0.59	0.92
Observations	350		
Log likelihood	− 203.35		
Akaike Inf. Crit	448.69		

Bold indicates statistically significant results

Reference categories: US citizen; Assistant and non-tenure track faculty; Biology; Far West

also explained by health and safety concerns (likely accentuated by COVID-19) and visa and immigration challenges.

Logistic Regression Predicting Intention to Leave

Given the clear differences in intention to leave among US and non-US citizens, we estimated a logistic regression model to examine the binary dependent variable, intention to leave the US. The Variance Inflation Factor for the model is lower than two for all variables meaning that variance of coefficients in the model is not inflated due to linear dependency with other exogenous variables (e.g., multicollinearity). The results are in Table 4.

Table 4 shows that the perceived impacts of visa and immigration policies on higher education and mobility are significant indicators of intention to leave. Faculty perceptions of an increased trend in international scholars seeking employment abroad are related to their own intentions to leave ($p < 0.10$). Faculty intention to leave is significantly related to reporting that visa and immigration policies have negative impacts on the broader higher education system ($p < 0.01$). Full professors ($p < 0.01$) are less likely than non-tenured faculty to report intent to leave. Faculty in the New England region ($p < 0.01$) are more likely to consider moving to a different country, compared to faculty in the Far West. This finding is possibly explained by the more severe COVID-19 outbreak and restrictions in New England at the time of this survey (Johnson et al., 2021). Citizenship status is significantly related to intention to leave, non-US Citizens with temporary resident visas ($p < 0.05$) are significantly more likely than U.S. citizens to report intention to leave, though as noted earlier the motivation behind the intent to leave varies by citizenship status.

Discussion

We analyze data on academic scientists' perceptions of and experiences with US visa and immigration policies and how those perceptions are related to their research, interactions with trainees, and intentions to leave the US. Before discussing the results as related to the research questions, we address a few limitations. The sample is limited to three STEM fields at research intensive universities. Because norms and expectations for travel, collaboration, and hiring trainees vary across fields, the findings may not be generalizable to other fields of science, social sciences, or humanities. Second, we did not collect respondent race, ethnicity, family structure, and country of origin data. We cannot assess differences across or at the intersection of these groups. Third, our model on intention to leave focuses on perceptions of visa and immigration policies, rather than labor market demand and supply issues. We look at faculty perceptions, but do not have objective measures of pull factors including job offers, salaries, or competitiveness of positions outside the US. Fourth, our study does not look at how department or university climate shapes faculty perceptions. Future studies should explore relationships between push and pull factors, including competition from universities outside the US, and between department and university responses to visa and immigration policies and faculty experiences.

Our first research question asked what are academic scientists' experiences with and perceptions of visa and immigration policies given recent political rhetoric, immigration policy changes and COVID-19 pandemic? Around one third report disruption related to university closures, travel delays, visa processing halts and delays, and interruption of

collaborations. Faculty believe current visa and immigration policies are having more negative than positive effects on US higher education. More than 80% of respondents report that US immigration policies are negatively impacting diversity, attraction of talent, open science, competitiveness, scientific workforce development and strength of US technology industries. These findings, while related to the COVID-19 pandemic, indicate longer term negative outcomes due to the shift toward a national security approach to immigration. These longer-term negative impacts are of greater concern to scientists than the temporary policies and rhetoric of a single president. These reports align with increasing concerns surrounding recruitment and retention of international scientists at US universities due to uncertainties and inefficiencies in visa processing (Roach & Skrentny, 2019). All academic scientists, regardless of their own immigration status, report negative outcomes from US immigration policy and believe it is harming the success and competitiveness of US higher education which will ultimately have lasting effects on STEM diversity and innovation.

The second research question asked how current visa and immigration issues are shaping scientists' experiences working with international students and postdocs. Respondents report increased complications related to student and postdoctoral recruitment and management. About half report a loss of new students and postdocs. Three quarters report increasing travel problems and uncertainty for current trainees. Most respondents to the survey reported having discussed employment, visa, immigration, and financial concerns with international students, half report providing mental health information and counseling recommendations, and around one-quarter reported discussing student decisions to leave the US. These results point to challenges in recruiting and retaining scientific talent as international scholars are increasingly uninterested in studying or working in the US, while simultaneously finding more competitive options outside the US (Freeman, 2010; Gopal, 2016; Marini & Yang, 2021). Faculty report that visa and immigration policies are driving international scholars away from the US, confirming previous findings that the shift in US immigration policy toward national security has reduced US competitiveness for top STEM scholars (Choudaha, 2018; Gopal, 2016; Sá & Sabzalieva, 2018; Wang et al., 2019).

Both domestic and international respondents indicate that a major reason for considering leaving the US is not feeling welcome due to political rhetoric and not feeling comfortable because of health and safety issues (Fig. 6). Other reasons differ by citizenship status, with US citizens noting pull factors such as work opportunities and non-citizens reporting push factors including immigration and visa issues for themselves and family members. Increasing uncertainties and delays in the visa and immigration process affect international scholars' sense of security and job satisfaction, both of which predict retention (Bookman, 2020; Rosser, 2004; Sabharwal & Varama 2017).

When faculty perceive their colleagues are more mobile, they report a higher intention to leave. This finding confirms trends in science mobility (Jacob & Meek, 2013) and points to a potentially endogenous relationship between intentions and behavior. Prior research finds foreign-born faculty have more global collaborative networks and are more likely to migrate than US counterparts (Finkelstein et al., 2009; Franzoni et al., 2012), and that more foreign-born scientists and engineers are returning to their home countries to improved higher education systems, competitive salaries, and for personal and cultural reasons (Freeman, 2010; Kim et al., 2020; Marini & Yang, 2021; Sabharwal & Varma 2016). The relationship between perceived mobility and behavior is concerning because as scientists become more mobile, the more both likely foreign-born and domestic scholars will face new opportunities and adjust perceptions, behavior, and intentions to leave.

A recent qualitative study of faculty intentions to leave found heightened concerns about Trump's policies and an increasingly hostile climate toward international

scholars drove intentions (Bookman, 2020). Our regression model indicates that faculty intentions to leave are not significantly related to perceptions of the potential positive and negative outcomes of Trump's visa and immigration policies (e.g. building a skilled labor supply, protecting jobs for Americans, ensuring public health). We find intention to leave is significantly related to perceptions of immigration policy damaging US higher education, recruitment, competitiveness, and diversity. This finding points to how immigration policy broadly shapes perceptions and work life for academic scientists, not just their own visa and immigration experiences but the experiences of their trainees, their ability to effectively collaborate with international scholars, recruitment and retention efforts, research agendas, and the reputation and competitiveness of the institutions where they work. These findings, taken together, indicate that shifts in US visa and immigration—beyond Trump's specific policies—are shaping STEM faculty perceptions, experiences, and behavior. Visa and immigration policies centered on national security, along with increased delays and bureaucratic hurdles in visa processing, when coupled with attractive pull factors elsewhere, negatively impact the ability of US higher education to advance internationally competitive science. Given these circumstances, it comes as no surprise that international and eventually domestic talent will begin to opt out of the US system (Gopal, 2016).

Conclusions

This research confirms much of the recent research on international faculty experiences in the US (Mamiseishvili & Lee, 2018; Mecoli, 2021) in response to shifts toward an immigration system focused on national security. Our data also capture the added tensions of the COVID-19 social distancing orders, embassy closures, travel restrictions and bans, and increased visa and immigration constraints. We find that STEM faculty, regardless of citizenship status, report increased concerns about the experiences of their international trainees, delays and negative effects on international research collaborations, and long-term negative effects on university success. The US higher education system has long enjoyed being a leader in STEM production, education, and training, attracting talent from around the world. Yet, the strong pull factors that historically drew international talent to the US are shifting and competing countries now offer strong STEM education program opportunities with easier paths to full time employment, residency and potentially citizenship (Freeman, 2010; Gopal, 2016; Kim et al., 2020; Sá & Sabzalieva, 2018).

Shifts in the US immigration policy toward national security; growing anti-immigrant sentiments and travel bans; and the COVID-19 pandemic limiting travel and highlighting the poor health care system and political strife in the US are inevitably shaping scientist opportunities, strategies, mobility, and collaboration patterns. While COVID-19 will pass and the Trump policies can be reversed, the longer-term negative effects on US higher education are not easily overcome. As our results show, faculty perceive the longer-term negative effects on the higher education system as more concerning than the outcomes of Trump's policies and these concerns coupled with perceptions of increased mobility are driving intent to leave.

Universities should be very concerned about the continued shift in immigration policy towards one of national security – it is negatively impacting higher education STEM fields, faculty and students, and research collaborations and other nations are responding by improving their university systems and offering competitive salaries and more amicable immigration systems (Freeman, 2010; Sabharwal & Varma 2016, 2017). These negative impacts will eventually translate into negative effects on the economy and STEM workforce. Our data show that current visa and immigration policies and practices in the US are having strong, negative effects on faculty perceptions and those perceptions, coupled with increase scientist mobility, are related to intent to leave the US, which is not in the best interests of US higher education or the broader scientific enterprise and workforce.

Appendix A Questionnaire items and descriptive summary

Survey question	Survey item	N	Mean	Std. Dev	Min	Max
In the past 12 months, did you experience any of the following? (Response categories: Did experience, did not experience)	You were unable to visit one or more collaborators in other countries	368	0.35	0.48	0	1
	You were unable to get a visa to visit one or more collaborators in other countries	368	0.09	0.28	0	1
	One or more of your international collaborators could not get a visa to attend a conference in the US	366	0.29	0.46	0	1
	You could not get a visa to attend a conference in another country	366	0.07	0.26	0	1
	Some project activities had to be canceled because of visa issues	367	0.24	0.43	0	1
	Some project activities had to be delayed because of visa issues	367	0.35	0.48	0	1
	The visit of an international research scholar or fellow intending to work with you for more than 3 months had to be canceled or postponed due to visa issues	368	0.33	0.47	0	1
In the past 12 months have you experienced any of the following (select all that apply)? (Response categories: Yes/No)	Employed one or more international students as research assistants or teaching assistants	371	0.53	0.50	0	1
	Worked on research with international students who you do not employ	371	0.48	0.50	0	1
	Mentored or advised international students who you do not work with on research	371	0.52	0.50	0	1
	Employed one or more international postdocs	371	0.32	0.47	0	1
	None of the above	371	0.19	0.39	0	1

Survey question	Survey item	N	Mean	Std. Dev	Min	Max
In the past 12 months, have you experienced any of the following? (Response categories: Yes/No)	International students and/or postdocs who work with you could not get US visas to come (or return) to the US	288	0.42	0.49	0	1
	You could not hire new international students and/or postdocs because of visa or immigration issues	285	0.45	0.50	0	1
	You lost international students and/or postdocs you or your department had recruited because of visa or immigration issues	286	0.54	0.50	0	1
	International students and/or postdocs you work with were unable to travel to their home country because of visa or immigration issues	295	0.72	0.45	0	1
In the past 12 months, have you supported and engaged the international students you work with or mentor in any of the following ways? (Response categories: Yes/No)	Maintain regular meetings or one-on-one meetings	284	0.83	0.37	0	1
	Encourage student to do counseling sessions	285	0.43	0.50	0	1
	Provide information regarding mental and health resources	283	0.52	0.50	0	1
	Discuss financial concerns	285	0.61	0.49	0	1
	Discuss employment concerns	285	0.76	0.43	0	1
	Schedule regular updates and outline communication expectations	285	0.77	0.42	0	1
	Host group, research, or lab meetings so students can maintain a sense of community	284	0.78	0.42	0	1

Survey question	Survey item	N	Mean	Std. Dev	Min	Max
In the past 12 months, have you discussed any of the following visa or immigration issues with international students or postdocs? (please check all that apply) (Response categories: Yes/No)	Visa uncertainties	371	0.69	0.46	0	1
	Inability to return to home country due to visa issues	371	0.58	0.49	0	1
	Inability to return to US due to visa issues	371	0.52	0.50	0	1
	Decisions to leave US due to visa or immigration issues	371	0.36	0.48	0	1
	Decisions to leave US due to family visa or immigration issues	371	0.27	0.44	0	1
	Postponement of their studies or research due to visa or immigration issues	371	0.43	0.50	0	1
	Cancelation of student research projects (e.g. field work, data collection) or funding due to visa or immigration issues	371	0.29	0.45	0	1
	Their loss of interest in their studies or research due to visa or immigration issues	371	0.25	0.44	0	1
	Concerns about harassment related to their national origin	371	0.39	0.49	0	1
	Concerns about physical safety in the US related to their national origin	371	0.34	0.47	0	1
	Limited funding opportunities due to visa or immigration issues	371	0.42	0.49	0	1
	Limited job prospects due to immigration or visa issues	371	0.50	0.50	0	1
	In your opinion, what effect do current US visa and immigration policies have on each of the following dimensions of the US higher education system? (Response categories: very positive effect, positive effect, no effect, negative effect, very negative effect)	Attraction of top talent to study in the US institutions of higher education	358	1.64	0.96	1
The reputation of US institutions of higher education		359	1.96	1.06	1	5
Diversity of US institutions of higher education		362	1.77	0.95	1	5
Global competitiveness of US science		355	1.75	1.06	1	5
Protection of US intellectual property		276	2.81	0.93	1	5
Openness of global science		354	1.73	0.99	1	5
Strength of US high technology industry		324	1.86	1.07	1	5
Development of scientific workforce		355	1.74	0.99	1	5
Public support of science		303	2.20	0.97	1	5

Survey question	Survey item	N	Mean	Std. Dev	Min	Max
In your opinion, to what extent have US visa and immigration policies increased or decreased the following? (Response categories: increased a lot, increase some, no change, decreased some, decreased a lot)	International scholars seeking employment outside the US	299	3.38	1.49	1	5
	US faculty seeking employment outside the US	236	3.41	0.97	1	5
	International student preference to work outside the US after graduation	302	3.9	1.15	1	5
	International student applications to study in US institutions	343	1.68	0.90	1	5
The Trump Administration has proposed a number of changes to the US visa and immigration system. To what extent do you think these potential changes will contribute toward achieving each of the following policy objectives? (Response categories: major contribution, minor contribution, no contribution)	Safeguarding national security	364	1.4	0.59	1	3
	Protecting university intellectual property	365	1.42	0.58	1	3
	Building a skilled labor supply	366	1.15	0.46	1	3
	Protecting jobs for Americans	368	1.33	0.56	1	3
	Increasing economic fairness and opportunity	362	1.15	0.44	1	3
	Minimizing racial, cultural and religious diversity	365	1.68	0.86	1	3
	Ensuring public health	361	1.17	0.46	1	3
	Distrust of foreign governments	364	2.29	0.81	1	3
	Increasing international understanding	364	1.09	0.37	1	3
	Penalizing particular countries or nationalities	363	2.43	0.78	1	3
In the past 12 months, have you seriously considered moving to another country? (Response categories: Yes/No)		370	0.37	0.48	0	1
Were any of the following reasons for considering moving to another country? (Response categories: major reason, minor reason, not a reason)	No longer feel welcome in the US due to political rhetoric	137	1.50	0.69	0	2
	No longer feel comfortable in the US due to health and safety	136	1.21	0.77	0	2
	University policies related to distance learning	132	0.22	0.52	0	2
	Work opportunities	132	0.64	0.78	0	2
	No longer feel comfortable in my department	134	0.31	0.57	0	2
	Family desire to move	134	0.77	0.80	0	2
	Immigration and visa issues concerning yourself	134	0.27	0.63	0	2
	Immigration and visa issues concerning your family	134	0.29	0.63	0	2
	Children's education and opportunities	134	0.63	0.80	0	2

Survey question	Survey item	N	Mean	Std. Dev	Min	Max
Please indicate your current work status (Response categories: native born US citizen, naturalized US citizen, non US citizen with a permanent US resident visa, non US citizen with a temporary US resident visa)	Non-US citizen (we recoded non US citizen with either permanent or temporary US resident visa as non-US citizen)	370	0.22	0.41	0	1

Appendix B Descriptive statistics for variables used for the logistic regression

Variables	N	Mean	St.Dev	Min	Max
Respondent perception					
Perceived positive policy outcomes	368	1.24	0.36	1	3
Perceived negative policy outcomes	367	2.14	0.62	1	3
Perceived mobility	358	2.94	0.89	1	5
Perceived impacts on higher education	366	1.89	0.82	1	5
Respondent characteristics					
Female	371	0.35	0.48	0	1
Non-US citizen	370	0.22	0.41	0	1
Non-tenure Track faculty	371	0.11	0.31	0	1
Assistant Professor	371	0.26	0.44	0	1
Associate Professor	371	0.21	0.41	0	1
Full Professor	371	0.42	0.49	0	1
Biology	371	0.72	0.45	0	1
Civil engineering	371	0.14	0.35	0	1
Geology	371	0.14	0.35	0	1
University characteristics					
University % non-US resident faculty	371	0.05	0.03	0.001	0.29
University % faculty of color	371	0.21	0.05	0.14	0.47
Far West	371	0.09	0.29	0	1
Great lakes	371	0.18	0.39	0	1
Mid East	371	0.16	0.36	0	1
New England	371	0.07	0.25	0	1
Plains	371	0.09	0.29	0	1
Rocky Mountains	371	0.02	0.14	0	1
Southeast	371	0.28	0.45	0	1
Southwest	371	0.11	0.31	0	1

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11162-023-09731-0>.

Acknowledgements The authors thank the SciOPS team for conducting survey design and implementation, and data for this paper, specifically Eric W. Welch, Lesley Michalegko, Mary K. Feeney, Timothy P. Johnson, Mattia Caldarulo, Ashlee Frandell, Shaika Lamia Islam, and Heyjie Jung

Authors' Contributions All authors whose names appear on the submission made substantial contributions to the conception or design of the work, acquisition, analysis, and interpretation of data; and drafting and completion of the manuscript. All authors approve the final version.

Funding This study was funded by the Arizona State University and the Center for Technology, Science and Environmental Policy Studies as part of a new science communication tool, SciOPS (www.sci-ops.org), which collects representative opinion data on current events from scientists in the United States to be shared with policy makers, journalists, and the general public.

Data Availability Data underlying the analytical models is available upon request.

Code Availability If accepted for publication, code underlying the analysis will be made publicly available.

Declarations

Competing interests The authors declare no competing interests.

Ethical Approval The data collection underlying this manuscript was approved by the Institutional Review Boards at Arizona State University and University of Illinois at Chicago.

Consent to Participate All research participants gave informed consent.

Consent for Publication All research participants gave informed consent and the researchers are only reporting data in the aggregate, thus ensuring individual identities are protected.

References

- Ackers, L. (2005). Moving people and knowledge: scientific mobility in the European union1. *International Migration*, 43(5), 99–131. <https://doi.org/10.1111/j.1468-2435.2005.00343.x>
- Altbach, P. G. (2005). Patterns in higher education development. *American Higher Education in the Twenty-First Century: Social, Political, and Economic Challenges*, 2, 15–37.
- Altbach, P. G., & Balán, J. (2007). *World Class Worldwide: Transforming Research Universities in Asia and Latin America*. JHU Press.
- Banks, M., & Bhandari, R. (2012). *Global student mobility The SAGE Handbook of International Higher Education*. SAGE Publications.
- Bollag, B. (2004). Enrollment of foreign students drops in U.S. *The Chronicle of Higher Education*, 51(13), A1.
- Bookman, B. (2020). Foreign-born faculty's perceptions and experiences in a turbulent sociopolitical climate. *International Journal of Multidisciplinary Perspectives in Higher Education*, 5(1), 52–75. <https://doi.org/10.32674/jimphe.v5i1.2726>
- Bratti, M., & Conti, C. (2018). The effect of immigration on innovation in Italy. *Regional Studies*, 52(7), 934–947. <https://doi.org/10.1080/00343404.2017.1360483>
- Cañibano, C., Otamendi, J., & Andújar, I. (2008). Measuring and assessing researcher mobility from CV analysis: The case of the Ramón y Cajal programme in Spain. *Research Evaluation*, 17(1), 17–31. <https://doi.org/10.3152/095820208X292797>
- Choudaha, R. (2018). 'A Third Wave of International Student Mobility: Global Competitiveness and American Higher Education', The Center for Studies in Higher Education, Research & Occasional Paper Series: CSHE.8.18.
- Corley, E. A., & Sabharwal, M. (2007). Foreign-born academic scientists and engineers: Producing more and getting less than their U.S.-born peers? *Research in Higher Education*, 48(8), 909–940. <https://doi.org/10.1007/s11162-007-9055-6>

- Danley, J. V. (2010). SEVIS: The impact of homeland security on American colleges and universities. *New Directions for Institutional Research*, 2010(146), 63–73. <https://doi.org/10.1002/ir.343>
- Finkelstein, M. J., Walker, E., & Chen, R. (2009). 'The internationalization of the American faculty: Where are we, what drives or deters us', *RIHE international seminar reports*, 13: 113–144. Presented at the International Conference on the Changing Academic Profession Project.
- Foote, K. E., Li, W., Monk, J., & Theobald, R. (2008). Foreign-born scholars in US universities: Issues, concerns, and strategies. *Journal of Geography in Higher Education*, 32(2), 167–178. <https://doi.org/10.1080/03098260701731322>
- Franzoni, C., Scellato, G., & Stephan, P. (2012). *Foreign-born scientists: mobility patterns for 16 countries Nature Biotechnology*. Nature Publishing Group.
- Franzoni, C., Scellato, G., & Stephan, P. (2014). The mover's advantage: The superior performance of migrant scientists. *Economics Letters*, 122(1), 89–93. <https://doi.org/10.1016/j.econlet.2013.10.040>
- Freeman, R. B. (2010). *What does global expansion of higher education mean for the United States? In American Universities in a global market*. University of Chicago Press.
- Freeman, R. B., Ganguli, I., & Murciano-Goroff, R. (2015). *Why and Wherefore of Increased Scientific Collaboration The Changing Frontier Rethinking Science and Innovation Policy*. University of Chicago Press.
- Gahungu, A. (2011). 'Integration of Foreign-Born Faculty in Academia: Foreignness as an Asset', *International Journal of Educational Leadership Preparation*, 6/1. NCEPA Publications
- Gandhi-Lee, E., Skaza, H., Marti, E., Schrader, P. G., & Orgill, M. (2017). 'Faculty Perceptions of Student Recruitment and Retention in STEM Fields', *European Journal of STEM Education*, 2/1. Lectio Journals.
- Gazni, A., Sugimoto, C. R., & Didegah, F. (2012). Mapping world scientific collaboration: Authors, institutions, and countries. *Journal of the American Society for Information Science and Technology*, 63(2), 323–335. <https://doi.org/10.1002/asi.21688>
- Gibson, J., & McKenzie, D. (2014). Scientific mobility and knowledge networks in high emigration countries: Evidence from the Pacific. *Research Policy*, 43(9), 1486–1495. <https://doi.org/10.1016/j.respol.2014.04.005>
- Gopal, A., & Streitwieser, B. (2016). 'International Students, Support Structures and the Equity Question'. *Inside Higher Ed*. Retrieved March 12, 2021, from <<https://www.insidehighered.com/blogs/world-view/international-students-support-structures-and-equity-question>>
- Gopal, A. (2016). Visa and immigration trends: A comparative examination of international student mobility in Canada, Australia, the United Kingdom, and the United States. *Strategic Enrollment Management Quarterly*, 4(3), 130–141. <https://doi.org/10.1002/sem3.20091>
- Guruz, K. (2011). *Higher Education and International Student Mobility in the Global Knowledge Economy* (2nd ed.). State University of New York Press.
- Harris, L. (2014). 'Education and Immigration: Why Keeping International Students Is a Good Thing for the Economy'. *HuffPost*. Retrieved March 12, 2021, from <https://www.huffpost.com/entry/education-and-immigration_b_5609706>
- Hawthorne, L. (2012). *Designer immigrants? International students and two-step migration The Sage Handbook of International Higher Education*. SAGE Publications.
- Hazelkorn, E. (2015). *Rankings and the Reshaping of Higher Education: The Battle for World-Class Excellence*. Palgrave Macmillan.
- Jackson, A. (2017). 'The 10 US colleges that stand to lose the most from Trump's immigration ban'. *Business Insider*. Retrieved March 12, 2021, from <<https://www.businessinsider.com/colleges-potentially-most-affected-trump-immigration-ban-2017-2>>
- Jacob, M., & Meek, V. L. (2013). Scientific mobility and international research networks: Trends and policy tools for promoting research excellence and capacity building. *Studies in Higher Education*, 38(3), 331–344. <https://doi.org/10.1080/03075079.2013.773789>
- Johnson, T. P., Feeney, M. K., Jung, H., Frandell, A., Caldarulo, M., Michalegko, L., & Welch, E. W. (2021). COVID-19 and the academy: opinions and experiences of university(-based scientists in the U.S. *Humanities and Social Sciences Communications.*, 8(1), 1–7.
- Kahn, S., & MacGarvie, M. (2020). The impact of permanent residency delays for STEM PhDs: Who leaves and why. *Research Policy STEM Migration, Research, and Innovation*, 49(9), 103879. <https://doi.org/10.1016/j.respol.2019.103879>
- Kania, E., & McReynolds, J. (2021). 'The Biden Administration Should Review and Rebuild the Trump Administration's China Initiative From the Ground Up'. *Lawfare*.
- Kerr, W. R., & Lincoln, W. F. (2010). The Supply Side of Innovation: H-1B Visa Reforms and US Ethnic Invention. *Journal of Labor Economics*. <https://doi.org/10.1086/651934>

- Kim, D., Roh, J. Y., & Barroso, E. T. D. (2018). To stay or not to stay: A decision to make upon completion of doctoral degrees among Asian international doctorates in US higher education institutions. In Y. Ma & M. A. Garcia-Murillo (Eds.), *Understanding international students from Asia in American universities*. Springer.
- Kim, D., Twombly, S., & Wolf-Wendel, L. (2012). International faculty in american universities: experiences of academic life, productivity, and career mobility. *New Directions for Institutional Research*, 2012(155), 27–46. <https://doi.org/10.1002/ir.20020>
- Kim, D., Twombly, S. B., Wolf-Wendel, L., & Belin, A. A. (2020). Understanding career mobility of professors: Does Foreign-born status matter? *Innovative Higher Education*. <https://doi.org/10.1007/s10755-020-09513-x>
- Kim, D., Wolf-Wendel, L., & Twombly, S. (2011). International faculty: Experiences of Academic life and productivity in U.S. universities. *The Journal of Higher Education*, 82(6), 720–747. <https://doi.org/10.1353/jhe.2011.0038>
- Lu, Z., Li, W., Li, M., & Chen, Y. (2019). Destination China: International students in chengdu. *International Migration*, 57(3), 354–372.
- Makalintal, B. (2021). ‘Asian Americans Are Calling on Allies in Response to a Wave of Violence’. *Vice*. Retrieved March 12, 2021, from <<https://www.vice.com/en/article/pkdw4z/attacks-on-elders-asian-american-community-racism-covid>>
- Mamiseishvili, K. (2013). Contributions of foreign-born faculty to doctoral education and research. *New Directions for Higher Education*. <https://doi.org/10.1002/he.20068>
- Mamiseishvili, K., & Lee, D. (2018). International faculty perceptions of departmental climate and workplace satisfaction. *Innovative Higher Education*, 43(5), 323–338. <https://doi.org/10.1007/s10755-018-9432-4>
- Mamiseishvili, K., & Rosser, V. J. (2010). International and citizen faculty in the United States: An examination of their productivity at research universities. *Research in Higher Education*, 51(1), 88–107. <https://doi.org/10.1007/s11162-009-9145-8>
- Marini, G., & Yang, L. (2021). Globally bred Chinese talents returning home: An analysis of a reverse brain-drain flagship policy. *Science and Public Policy*, 48(4), 541–552.
- Mecoli, N. A. (2021). Employment in the Time of Crisis: International Faculty and Recessional Events in American Higher Education (Doctoral dissertation, University of Florida). <https://www.proquest.com/openview/f64fb770bb3e123f28951d9c4c3a45c4/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Moed, H. F., Aisati, M., & Plume, A. (2013). Studying scientific migration in Scopus. *Scientometrics*, 94(3), 929–942. <https://doi.org/10.1007/s11192-012-0783-9>
- National Science Board. (2014). *Science and Engineering Indicators 2014*. Alexandria, VA: National Science Foundation. Retrieved from <<https://www.nsf.gov/statistics/indicators/>>
- National Science Board. (2020). *Science and Engineering Indicators 2020*. Alexandria, VA: National Science Foundation. Retrieved from <<https://www.nsf.gov/statistics/indicators/>>
- Nerdrum, L., & Sarpebakken, B. (2006). Mobility of foreign researchers in Norway. *Science and Public Policy*, 33(3), 217–229. <https://doi.org/10.3152/147154306781779000>
- Roach, M., & Skrentny, J. (2019). Why foreign STEM PhDs are unlikely to work for US technology startups. *Proceedings of the National Academy of Sciences*, 116(34), 16805–16810. <https://doi.org/10.1073/pnas.1820079116>
- Rosser, V. J. (2004). *Faculty Members’ Intentions to Leave: A National Study on Their Worklife and Satisfaction Research in Higher Education*. Springer.
- Sá, C. M., & Sabzalieva, E. (2018). The politics of the great brain race: Public policy and international student recruitment in Australia, Canada, England and the USA. *Higher Education*, 75(2), 231–253. <https://doi.org/10.1007/s10734-017-0133-1>
- Sabharwal, M., & Varma, (2017). Grass is greener on the other side: Return migration of indian engineers and scientists in academia. *Bulletin of Science, Technology & Society*, 37(1), 34–44.
- Sabharwal, M., & Varma. (2016). Return migration to India: Decision-making among academic engineers and scientists. *International Migration*. <https://doi.org/10.1111/imig.12265>
- Schiller, D., & Diez, J. R. (2008). ‘Mobile star scientists as regional knowledge spillover agents’, IARED Working Paper, 11: 3–33.
- Siekierski, P., Lima, M. C., Borini, F. M., & Pereira, R. M. (2018). International academic mobility and innovation: a literature review. *Journal of Global Mobility the Home of Expatriate Management Research*. <https://doi.org/10.1108/JGM-04-2018-0019>
- Slaughter, S. (2014) ‘Rethorizing Academic Capitalism: Actors, Mechanisms, Fields, and Networks’, *Academic Capitalism in the Age of Globalization*, JHU Press, MD
- Stephan, P. E., & Levin, S. G. (2003). ‘Foreign Scholars in U . S . Science : Contributions and Costs’, *Science and the University*, 237/April.

- Stephan, P., Franzoni, C., & Scellato, G. (2013). *Choice of Country by the Foreign Born for PhD and Postdoctoral Study: A Sixteen-Country Perspective* (No. w18809). NBER working papers series. National Bureau of Economic Research. Retrieved March 12, 2021, from <<http://www.nber.org/papers/w18809.pdf>>. DOI: <https://doi.org/10.3386/w18809>
- Stephan, P. E., & Levin, S. G. (2000). Exceptional contributions to US science by the foreign-born and foreign-educated. *Population Research and Policy Review*, 20(1–2), 59–79. <https://doi.org/10.1023/A:1010682017950>
- Sun, X. E., & Bian, Y. (2012). Ethnic networking in the transnational engagement of Chinese American scientists. *Asian Perspective*, 36(3), 435–461.
- Teich, A. H. (2014). 'Streamlining the Visa and Immigration Systems for Scientists and Engineers', Issues in Science and Technology, University of Texas at Dallas
- Toren, N. (1996). Integration of immigrants in science, medicine and engineering and the structure of collegial networks in Israel. *Science and Public Policy*, 23(6), 361–367. <https://doi.org/10.1093/spp/23.6.361>
- Trapani, J., & Gibbons, M. (2020). *Academic Research and Development* (No. NSB-2020–2). Science and Engineering Indicators 2020. Alexandria, VA: National Science Board. Retrieved March 9, 2021, from <<https://nces.nsf.gov/pubs/nsb20202/>>
- Trump, D. J. (2018). 'Presidential memorandum on optimizing the use of Federal government information in support of the national vetting enterprise'. The White House.
- US Department of State & Bureau of Consular Affairs. (2020). 'Suspension of Routine Visa Services'. Retrieved March 12, 2021, from <<https://travel.state.gov/content/travel/en/News/visas-news/suspension-of-routine-visa-services.html>>
- van Holm, E. J., Wu, Y., & Welch, E. W. (2019). Comparing the collaboration networks and productivity of China-born and US-born academic scientists. *Science and Public Policy*, 46(2), 310–320. <https://doi.org/10.1093/scipol/scy060>
- Varma, R., & Kapur, D. (2013). Comparative analysis of brain drain, brain circulation and brain retain: A case study of Indian Institutes of Technology. *Journal of Comparative Policy Analysis*, 15, 315–330.
- Wadhia, S. S. (2018). National Security, Immigration and the Muslim Bans. *Washington and Lee Law Review*, 75, 1475.
- Wadhwa, V., & Salkever, A. (2012). *The immigrant Exodus: Why America is losing the global race to capture entrepreneurial talent*. Wharton Digital Press.
- Wagner, C. S., & Leydesdorff, L. (2005). Network structure, self-organization, and the growth of international collaboration in science. *Research Policy*, 34(10), 1608–1618. <https://doi.org/10.1016/j.respol.2005.08.002>
- Wagner, C. S., Whetsell, T. A., & Leydesdorff, L. (2017). Growth of international collaboration in science: Revisiting six specialties. *Scientometrics*, 110(3), 1633–1652. <https://doi.org/10.1007/s11192-016-2230-9>
- Wang, J., Hooi, R., Li, A. X., & Chou, M. (2019). Collaboration patterns of mobile academics: The impact of international mobility. *Science and Public Policy*, 46(3), 450–462. <https://doi.org/10.1093/scipol/scy073>
- Welch, E. W., van Holm, E. J., Jung, H., Melkers, J., Robinson-Garcia, N., Mamiseishvili, K., & Pinheiro, D. (2018). 'The Global Scientific Workforce (GTEC) Framework' STI 2018 Conference Proceedings. Centre for Science and Technology Studies (CWTS), 868–71
- AB Wire. (2020). 'Trump extends executive order suspending H-1B till March'. *The American Bazaar*. Retrieved March 12, 2021, from <<https://www.americanbazaaronline.com/2020/12/31/trump-executive-h-1b-order-set-to-expire-443630/>>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.