

The Immigrant STEM Training Valley of Death

Challenge and Opportunity

[Reporting from the National Bureau of Economic Research](#) concludes that immigrants contribute economically to the American economy as shown in a study from 1990 to 2016, wherein immigrants produced 25% of the aggregate economic value created by patents in publicly traded and private companies. Further, the [Small Business Administration \(SBA\) reports](#) that STEM entrepreneurship is most common among adult immigrants who came to the U.S. for higher education. The SBA further reports that as a result of restrictions on their work opportunities due to temporary status, foreign-born temporary resident workers from non-E-2 countries are the least likely to engage in entrepreneurship. SBA also reports higher rates of dissatisfaction among highly skilled immigrant workers with the intellectual challenge and level of responsibility their jobs provide. Similarly for graduate student and postdoctoral researchers (postdocs) job conditions that subject them to financial insecurity is [detrimental to their ability to pursue opportunities in the U.S. and stay in STEM fields](#).

Poor mentorship and working conditions are driving high rates of mental health disorders and pushing graduate students and postdocs out of science research. [A Nature survey of postdocs](#) found that work related mental health concerns were driving 51% of postdocs to consider leaving science; 65% had experienced bullying or power imbalances during their time as a postdoc; and 74% had observed this happening with other postdocs in their research group. Similarly, [researchers have found](#) that about 39% of graduate students in the U.S. report symptoms of moderate to severe depression and 41% report symptoms of moderate to severe anxiety. Of these students, the majority disagreed with the statement that “their PI/advisor is an asset to their career,” indicating poor advisor-advisee relationships.

Immigrants are particularly vulnerable to poor mentorship and working conditions due to their visa status. [Researchers say](#) that advisors with a track record of “sustained hostile behaviour, potentially including ridicule, threats, privacy invasions and interference with career progression...often target international scholars because of their immigration status, financial vulnerability and lack of support networks.” Students facing exploitation can struggle to leave hostile work environments due to the fact that the vast majority of graduate students and postdocs are dependent on their PI’s research grants for funding.

The importance of harnessing international knowledge is evident in [the report in Nature](#), with 37% of U.S. academic papers referencing sources outside the nation. It sustained increase since 1980, indicating the value of global intellectual collaboration. The benefit of international knowledge extends to bidirectional innovation of patents. [Data from European countries](#) indicate that a 1% increase in migrants can substantially augment cross-border patent citations by 0.397% underscoring the global knowledge spillovers provided by immigrants, contributing to catalyzing global scale innovation by adding elements of gender and international diversity as mentioned in [recent research](#). While there might be a perception that immigrants negatively

impact U.S. science by generating fewer localized spillovers because knowledge flows are more internationally-oriented, [a paper in Research Policy](#) shows that immigrants are not detrimental to U.S.. Instead, they generate at least an equivalent level of localized spillovers, as indicated by citation counts, compared to the domestically-trained scientists they supplement.

An alternative funding mechanism is available though: federally- and philanthropically-funded research fellowships provide students with the financial security to leave toxic research groups and find better advisors. Young scientists may also want to switch research labs due to a lack of research interest alignment or evolving research interests that draw them in new directions. [Studies of the NSF Graduate Research Fellowship Program](#) have shown that fellowship awards have tremendous benefits: they increase the rates of “degree completion, placement in a post-doctoral or academic research position, research productivity and impact, and network size.” Similarly, [studies of the NIH’s National Research Service Award \(NRSA\) \(F32\) for postdocs](#), demonstrate that the fellowship promotes the retention of scientists in the research and biomedical workforce pipeline.

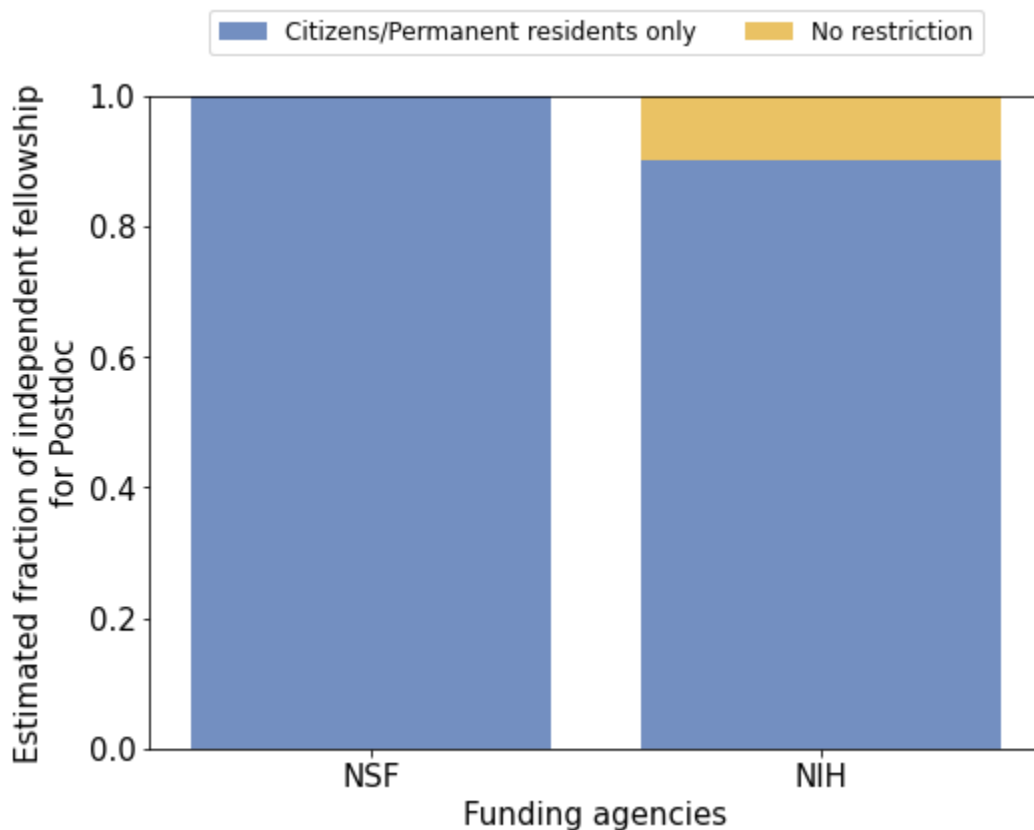


Figure 1. Ratio of NSF and NIH postdoctoral fellowships for citizen/permanent residents only versus no restrictions.

Unfortunately, the majority of research fellowships are federally funded, and of those, the vast majority are only eligible for U.S. citizens. There are five major federally funded graduate student research fellowship programs—the NSF Graduate Research Fellowship Program, the

NIH Kirchstein Predoctoral NRSA for PhD students and dual-degree students (F31 and F30), the National Defense Science and Engineering Graduate Fellowship, and the DOE Computational Science Graduate Fellowship—all of which require applicants to be U.S. citizens or permanent residents. For postdoctoral research, the NSF and NIH are the two major agency funders. [All NIH postdoctoral fellowships](#) have citizenship or permanent residence requirements. Of the NIH postdoctoral fellowship programs, the K99, K00, K38 are the only ones that immigrant postdocs are eligible for. These three fellowships combined have only one-tenth of the budget of the NIH's main postdoctoral fellowship program, the NRSA, even though [international students make up half of all postdocs](#). Thus, there is a severe lack of federal fellowship funding for international graduate students and postdocs.

Plan of Action

Recommendation 1: The NSF and NIH should expand eligibility for major federal science fellowships to include international students by removing the citizenship or permanent residence criteria for the GRFP and the NRSA (F30, F31, and F32), respectively. This would enable international researchers to access more stable sources of funding and reduce the financial power that PIs hold over their graduate students and postdocs. However, there are currently a very limited number of fellowships, which leads us to our second recommendation.

Recommendation 2: The NSF and NIH should expand federal funding of graduate students and postdocs through fellowships in place of research grants. This would entail reallocating existing federal research funding for graduate students and postdocs away from research project grants and towards research fellowships. The National Academies has made [similar recommendations, multiple times](#), to direct more funding to trainees instead of PIs in order to reduce hierarchical power structures and improve the training of graduate students and postdocs. This could be done by 1) significantly expanding the number of graduate student and postdoc fellowships to cover the desired number of trainees across the country and 2) gradually reducing research project grant sizes to account for graduate student and postdocs being increasingly funded by fellowships and not requiring research project grant funding.

Conclusion

By following these recommendations, federal science agencies can empower all graduate students to pursue their research interests in supportive work environments, ensure more positive and equitable outcomes, and reap the benefits of greater scientific progress. In particular, the inclusion of immigrant graduate students and postdocs in research fellowship eligibility holds great potential for retaining and ensuring the success of a disproportionately productive and impactful demographic of scientists and entrepreneurs, with substantial spillover benefits to American scientific progress and the economy.