Leigh Ann: It's really the proportion of foreign science and engineering doctoral recipients, who receive their doctorates from US institutions, that are in the US. And, we usually look at a particular time period, either 5, or 10, or 15 years after graduation.

Leigh Ann: So, what proportion of foreign nationals who came to the US to get a PhD in STEM, five years later after that degree are still in the US? Or 10 years after that degree are still in the US? So, we would call that a 5 year stay rate or a 10 year stay rate.

Automated Voice: This is the ORISE feature cast a special edition of Further Together the ORAU podcast. Join your hosts, Michael and Jenna, for conversations with ORISE research program participants and their mentors as they talk about their experiences and how they are helping shape the future of science. Welcome to the ORISE feature cast.

Michael Holtz: Welcome to another edition of the ORISE feature cast. I'm your host, Michael Holtz with my cohost-

Jenna Harpenau: Jenna Harpenau.

Michael Holtz: We are really excited to have with us today, Leigh Ann Pennington and Mike Finn to talk about foreign national stay rates. And, we'll go into more detail about what those four words mean.

Jenna Harpenau: Yeah.

Michael Holtz: But first, Leigh Ann and Mike, will you introduce yourselves. Tell us who you are.

Leigh Ann: Sure. I'm Leigh Ann and my training is in economics, specifically library economics. So, I've spent a part of my career studying the pipeline for science and engineers. But I've also spent a part of my career as a program manager for science and engineering workforce development programs.

Michael Holtz: Okay.

Leigh Ann: And as part of that, doing some program assessment and evaluation, which all ties into measuring the pipeline for scientists and engineers. So it's a nice package to have done all of those things here at ORAU.

Jenna Harpenau: Great.

Michael Holtz: Awesome. And Mike, tell us who you are.

Mike Finn : I started at ORAU in 1976 and I'm now retired, but I was an economist all that time. And I had previously gotten a PhD in economics and taught a little at Ohio State University.

Mike Finn : But, I was more interested in applied research and I found that that worked out at ORAU. I was able to do that. Things that probably you wouldn't be doing if you were in an academic setting and I enjoyed that.

Mike Finn : So, I worked in the same unit for all those years, 39 years I think, before I took retirement status. And, and I worked with Leigh Ann for all the time that she's been there. I think that's about 20 years isn't it? Or more?

Leigh Ann: Closer to 30. Time flies.

Michael Holtz: One of the things I love about this podcast is we always learn about something new that we do in the organization that we didn't really know was being done.

Michael Holtz: Like this. How did we get started in tracking, measuring what we call the foreign national state rate?

Mike Finn : Well, it's kind of interesting. Back in the 70s we had a big oil price increase and we started the Department of Energy. And, that's when they hired me to come in and some others. We had a group that was doing what they called manpower research for the Department of Energy.

Mike Finn : And, they were interested in making big investments in a lot of different energy technologies. They wanted us to assess the adequacy of the existing human resources and whether there would be enough people trained in specialized areas in order to carry out these plans for whatever it was: nuclear, coal, solar, all these things that they needed to expand.

Mike Finn : And so, we were doing studies trying to look into the future. So, what if they put a big investment in magnetic fusion energy, and what are the needs going to be, and are we training enough people in that area?

Mike Finn : And when I started working on this, I realized that, gosh, in engineering at least a third of the new PhDs were foreign nationals. And we didn't have any information about whether they stayed in the United States or not, that the government didn't collect that information.

Mike Finn : And so I tried to figure out a way to do it. And, it really is broader issue than the Department of Energy. So I initially got some funding from the National Science Foundation and from the Sloan foundation to get started on this topic. And, then the Science Foundation found it useful and they've been funding it ever since.

Mike Finn : One thing that I'm a little bit proud of is that we kind of stuck with it. And, they don't come to us and say, do this for us. We have that submit proposals and I think that we managed to create a useful time series.

Mike Finn : So, we not only measure what the stay rate is, but how has it changed over time, which is often relevant if people are concerned about policy. For example, some people are concerned that there are restrictions. It's hard to get a visa and that too many of these people are going home. So, it's one thing to say that X percent of them are staying here. But if you can say, "And this is how it changed over time..." You may be able to allay some fears about what's happening.

Jenna Harpenau: Great. You touched on it briefly, but Leigh Ann can you explain exactly what stay rate means, for those that might not know that are listening?

Michael Holtz: Absolutely.

Leigh Ann: Yeah, sure. I have a sort of a simple, Mike will probably give a more elaborate, but I have a simple way of thinking about it and it's really the proportion of foreign science and engineering doctoral recipients, who received their doctorates from US institutions, that are in the US. And we usually look at a particular time period, either five, or 10, or 15 years after graduation.

Leigh Ann: So what proportion of foreign nationals who came to the US to get a PhD in STEM, five years later after that degree are still in the US. Or 10 years after that degree are still in the US. So we will call that a five year stay rate or a 10 year stay rate.

Jenna Harpenau: Okay, great. And why is this so important? Mike gave us a quick rundown about how it got started, but in today's age, why is tracking the stay rates of these foreign nationals so important to us?

Mike Finn : Let me comment on that. Immigration and immigration policy is a pretty big issue these days. And there's a lot of different ideas on what the government should be doing. And within the academic research there's even some disagreement and how to measure the effects of immigration.

Mike Finn : But one thing that the economists can agree upon is that highly skilled immigration, the immigration of highly skilled people, is good for the economy. And so, I think that's the main reason why it's important that everyone knows that the US is generally better off if, after we spend a lot of resources training these people in American universities, if most of them stay here to work in our economy.

Michael Holtz: Because, it essentially means that the talent is staying, at least for some period of time.

Leigh Ann: Right.

Michael Holtz: They're getting trained, they're staying here and they're using the skills they learned-

Leigh Ann: Exactly.

Michael Holtz: ... here as opposed to taking it back home.

Mike Finn : Right. Or, maybe not staying. I'm old enough to have gone to school in the 1960s. And, back then, I think it's fair to say there was a concern about brain drain from the poor developing countries. And if you raised the issue back then, most people in academia or government would say, "Oh we're concerned and we want these peoples to go back home and help their countries."

Mike Finn : But, now many of these countries are our competitors like China and India, Brazil, et cetera. So maybe that explains why we're more focused on keeping them rather than sending them back.

Leigh Ann: But also would add, I think most people think science is an international, a global enterprise, and requires global collaboration in the best case if possible. And, it may not be that it's a brain drain, for that country, if they stay here. It may allow for those people that come here from another country to connect better with researchers back in that country so that we can have more collaboration.

Leigh Ann: I think there is another way to think about it, and that it's good perhaps to maintain these people just so that we have connections to their home countries and can collaborate in a more effective way if they're here and can tie us to those resources.

Michael Holtz: Sort of expanding the partnerships and-

Leigh Ann: I mean that's-

Michael Holtz: Possibilities and-

Leigh Ann: ...that might be a slightly more positive way, a positive spin, in terms of how it connects to what ORAU does, which is try to develop the science and engineering pipeline here in the US.

Leigh Ann: Mike and I have articulated through the years how important it is to understand this component. And that plays into our programs. We can't project the pipeline if we don't know this large component of the pipeline and what percentage are staying here.

Leigh Ann: So, it feeds nicely into our workforce development programs here at ORAU to make sure that we do this research and that we understand this important component in the pipeline.

Mike Finn : To Leigh Ann's point about the brain drain, I should comment that we did some research a few years ago that helped us measure how many of these people were going back and forth. That is, when we say that a certain percentage, like 70%, are staying here after 10 years, it doesn't necessarily mean that every one of them was here for every one of those 10 years. It means that 70% we're here on year 10.

Mike Finn : But, when we actually look at how the movement occurs, we find that significant numbers have left the country and come back. And, in addition to that kind of movement, where the somebody might spend two years abroad and come back, we also know that there are many, particularly academics, who might spend their summer in another country, or an academic year, or something like that.

Mike Finn : So there's that kind of movement. And of course now with the internet, there's a lot of collaboration where people don't even have to meet together face to face.

Michael Holtz: Gotcha. That makes a lot of sense. So, we're neither mathematicians nor economists. How do you measure the stay rate? How do you arrive at that data and that percentage? Mike?

Mike Finn : Okay, I'm going to do half of this and I'm going to give half of it to Leigh Ann. When we started, there wasn't a suitable survey that we could use to measure this and we began to use administrative data. I discovered that the tax records maintained by the social security administration would allow them to tell us, anybody if they chose to, whether somebody was paying taxes.

Mike Finn : Well, of course, that's private information. They had information on both FICA taxes, our social security, Medicare, and also on the IRS 1040 forms. Well obviously, this is highly sensitive information. But, I discovered it's possible to ask them to give you summary information on a group of people. So, if we could identify a group of people, like people who got engineering degrees from US universities in a given year and then ask five years later what proportion of that group are earning above some trivial level of income, then we could define that as a stay rate.

Mike Finn : The trickiest thing was getting all the administrative stuff worked out because, as you can imagine, they want to make sure that there is no possible way that you would be able to see or infer any information about any individual.

Michael Holtz: Sure.

Mike Finn : But yet you can mine the confidential information for some broad statistical measures.

Michael Holtz: Okay.

Mike Finn : But, that's not how we do it anymore. Now we use a survey that the National Science Foundation conducts. And let me let Leigh Ann talk about that, since she's been doing the latest work with that.

Leigh Ann: Sure. So, as Mike mentioned, we had been doing something that was really very novel in tying administrative data from two federal agencies. Basically, we started with who are the PhDs from foreign institutions that the NSF collected from what they call The Survey of Earned Doctorates that every doctor recipient completes when they get their degree.

Leigh Ann: We tied that information based on social security number to these tax records at the Social Security Administration. One more plug for Mike's innovation on that, before we move to the current way we're doing it. Now there's a 2020 Federal Data Strategy. It's really interesting reading. If you're interested in federal data collection, you can Google it and it talks about doing exactly what Mike did. It's making data a more leveraged asset for the country and for taxpayers and linking administrative data in ways that we don't have to continue to survey people and use data we already have.

Leigh Ann: So, Mike was really ahead of his time on this. And, I think it's interesting to now read this data plan, this data strategy, that talks about doing some of the things we did so long ago.

Leigh Ann: One of the problems that we've addressed currently with NSF, National Science Foundation, as the sponsor is that they stopped collecting full social security numbers in that Survey of Earned Doctorates. And so, it's more difficult for us to match with social security data.

Michael Holtz: Okay.

Leigh Ann: As a matter of fact, we have not gotten them to agree to match on other ways, because they want to make sure the match is correct. So, we had to think creatively and there was another survey that was not a population but a sample survey done by the National Science Foundation called the Survey of Doctorate Recipients that is a longitudinal study of those that receive PhDs and does include foreign nationals. And, in the last decade has included foreign nationals that even go home.

Leigh Ann: So, it gave us another source of data to measure at a point in time, typically every two years in February. Where are you? Are you in the United States, relative to when you got your degree five or 10 years ago. So, same concept, not the same data. Still using an existing federal data set, not going out and collecting new data, but using an existing federal dataset to estimate from a sample now, rather than a population, the proportion that survey and respond to the question in February every two years that they're still in the US.

Leigh Ann: So, that's now how we're calculating stay rate. So we're doing some comparison to see that the two data trends compare so that we can transition to this new series, assuming that we can't get full socials.

Leigh Ann: So, it's an exciting time. It gives us hope that we'll continue to do this, perhaps with a different data source, but we'll be able to continue our trend that we've established over the last 20 years on stay rates.

Michael Holtz: Awesome. So-

Mike Finn : One more comment. You know, there's some error in all, all measurements of this type, government statistics, et cetera. And, we were very gratified when we had a few years where we had estimated the stay rate using both of these methods and found that they agreed almost perfectly. So, when you take a totally different approach to measuring the phenomenon and you end up with the same number, it gives you a lot more confidence in the number that you generated.

Michael Holtz: Definitely. And I assume that National Science Foundation is very happy about that.

Leigh Ann: They're very happy.

Michael Holtz: So, where we stand now with I guess the latest report, what is the percentage of foreign nationals that are staying in the United States?

Leigh Ann: Mike, you want me to run through some numbers real quick?

Mike Finn : Well, I would say 70% would be the best number. That's the most recent... estimates have been up around there. And, that has increased somewhat in the last 15 years. Today it's close to 70% for both five and 10 years after graduation.

Mike Finn : The longterm, 15, 16 years, may be a little lower. But that may catch up as well when we get the younger cohorts who are old enough to have been here 16 years. But, it's definitely increased over the last 15 years and it's above two thirds.

Mike Finn : Now, that's people who are on temporary visas at the time of graduation. That's most foreign people who are getting doctorates. However, there are a few, maybe 10% of the PhD recipients who are foreigners with permanent resident visas and they behave more like Americans. Nearly all of them stay.

Michael Holtz: Yeah.

Jenna Harpenau: Now, which countries and disciplines have the highest stay rates?

Mike Finn : China and India have had the highest stay rates for a long time. Saudi Arabia always has the lowest stay rates. I'm not sure why, but I'm guessing that if you get a PhD in science or engineering, you can get a pretty good job back home in Saudi Arabia.

Leigh Ann: Specific for China and India, in 2017 we had a five year stay rate of about 83% for both countries compared to this overall of about 70%. So, they were clearly showing higher stay rates. I'll mention South Korea as another country that typically has pretty low stay rates. We were showing about 57% in '17-

Michael Holtz: Okay.

Leigh Ann: ... at one of the lower countries. One of the disadvantages of the new data is we're not able to get as fine data on country, so-

Michael Holtz: Gotcha.

Leigh Ann: ... we're using larger country groupings, but we're still able to get these large countries, South Korea is one that's showing a lower stay rate.

Michael Holtz: Okay.

Leigh Ann: And then, in terms of disciplines, it's not surprising that it's typically computer and math and engineering with high stay rates. Five year stay rate in 2017, we were showing 78% for computer and math.

Jenna Harpenau: Wow.

Leigh Ann: And 75 for engineering. Again, compared to about 70 overall. And then social scientists tend to go home with a stay rate in the 50-52% for social scientists.

Michael Holtz: Okay.

Leigh Ann: Mike, you want to add anything on disciplines?

Mike Finn : No, I think that covers it. I think all of the sciences are at or above average. It's really only the social sciences that are significantly below the average.

Leigh Ann: Right. And, one more thing about the countries with the highest stay rates, we are hearing some chatter in the news about the China and India stay rates that they are maybe going down some. And, our data does show that. It is a very large group, so they have a large impact on the overall rate, because there are lots of China and India citizens that come to the US to get PhDs in science and engineering.

Leigh Ann: But, just as an example, if we looked at a five year rate for China and India, so China is going from about 93% in 2003 to 83% in 2017 and India is going from about 90% in 2003 to 83% in 2017. So, we are seeing some slow down perhaps in the rate for China and India. Mike, do you agree with that?

Mike Finn : Yes. People are out there saying we need to act quickly to make it easier for people to stay, to get visas, because this is happening. I don't find it alarming because the overall stay rate hasn't gone down. It's gone up. And, what we're seeing is higher stay rates from countries like Brazil and Korea than we saw back 15 years ago. So, in a sense, we're getting more diversified. They at the two largest countries are perhaps making up a little bit smaller share of the total and we're getting more people from some other countries.

Michael Holtz: This may sound like an obvious question, and maybe it is, but if the overall stay rate has been on the increase, does that speak to more slash better opportunities for them to stay? I mean, again, I know that sounds obvious, but-

Leigh Ann: Yes. Clearly there's opportunities here. One of the things people are saying about China is that there are more opportunities back home for those folks as their research enterprise grows, which we know, and India as well to some extent, but we know certainly China is booming in terms of their science and engineering. There's more opportunities for them to go back.

Leigh Ann: So that may be just the opposite of what you've asked. Yeah, opportunities is what keeps people there. But, we hope there are plenty of opportunities here. It seems like a lot are choosing to stay. But, Mike, your thoughts?

Mike Finn : There's been some research on the broader question of what causes people to stay versus go. What's influencing the stay rate? And, as you can imagine, economists would focus on factors in the home country versus factors here in the US. And, people have tried to measure that and explain it. And, there's both economic factors and then quality of life, social, political issues, and all these things.

Mike Finn : I don't think this research is very definitive, but clearly it seems that it's a balance of the pull factors for being in the US versus the push factors for going back home and the ease with which people can get visas in the US. Now, it's not easy to get a permanent resident visa, even though you have a PhD in science or engineering. But there was a change a few years ago that made it easy to get a temporary visa for the first, I think it's three years. It's called Optional Practical Training, I believe. And, it's now quite easy for foreign PhD, or masters I think as well, recipients to get that first three year visa.

Mike Finn : So, that may be making it easier for them to get a longer term visa since they are able to get started here quite, quite easily.

Michael Holtz: Okay. That makes sense. Anything that you want to say about stay rates that we've not asked, that we've not covered?

Leigh Ann: Well I'll make two things and then I'll turn it over to Mike to close. I just want to make sure that we mention that nearly all of this research, at least except for some in the early, early years has been funded by the National Science Foundation.

Leigh Ann: And, where do you go to get more data on stay rates? Because there's a whole lot more data than we've been able to talk about here. There are two great sources. One is the National Science Foundation website. If you search 2020 science and engineering indicators, you'll see the science and engineering labor force report and that has all the 2017, the most up to date data.

Michael Holtz: Okay.

Leigh Ann: The ORISE website has all the historical data with some great infographics. If you just go to the ORISE website and search workforce studies, you'll see all the stay rate data that we've done. So, there's lots of data. We'd love to take questions or anything further after, we've got contact information on the website.

Jenna Harpenau: Fantastic.

Michael Holtz: Awesome.

Michael Holtz: Mike, anything to close?

Mike Finn : No, I'd just say give the questions to Leigh Ann because I'm finally retired completely.

Michael Holtz: And I believe your contact information, Leigh Ann, is on the website, or at least for workforce studies.

Jenna Harpenau: Yes, and Don Johnson's as well, who is really over the workforce studies group.

Michael Holtz: Okay. Thank you both very much for being with us today.

Leigh Ann: Thank you.

Michael Holtz: And shedding some light on foreign national stay rates, and the research, and why it's important to what we do.

Leigh Ann: Thanks.

Mike Finn : You're welcome.

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