TEN

Research Universities and the Global Battle for the Brains

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Across the globe, national governments and research universities are trying to attract foreign students to their universities. A special though not exclusive focus of this "battle for the brains" is on science and engineering talent, including graduate students and postdoctoral researchers. As David Baker highlights in chapter 2 of this volume, the increasing role of science, technology, engineering, and math (STEM) in academia has coincided with increasing demands for international students. This demand for international students in STEM has especially transformed graduate education, with some fields in the US averaging enrollments of more than 70 percent foreign-born.

In other contexts, large numbers of incoming migrants lead to concern, and even alarm or panic, as native populations fear they will lose their community or job opportunities. Governments respond by seeking to restrict immigration. Yet in many countries, foreign *students* are welcomed, and governments as well as universities seek to increase their numbers.

These policy elites must see international students as the solution to one or more problems—they see it as rational to attract and enroll them in universities. Our question is simple: Why? Why not focus on serving local populations, including those whose tax money (in the case of public institutions) helps to support the universities?

Part of the reason is simply that there are more foreign students, in STEM and other fields, than ever before. There are students in developed countries willing to move for their education, but there are even greater numbers of talented people in poorer countries who perceive limited opportunities or low wages at home. As migration theory would predict, the growing number of college-educated persons, especially in populous countries such as China and India, have been a boon for graduate programs across the world.[1] At

the same time, some college age cohorts, such as in the United States, have actually shrunk.[2] In short, there are more qualified students in the world, and fewer at home.

But we focus here on the demand side. Education scholars have identified a long list of potential sources of the demand for international students.[3] One of the problems that international students help to solve is age-old: how to attract the most talented students available and to improve the educational experience on campus. This problem, though real, has always existed. Universities, especially those focused on research, want the best. What are more interesting from the perspective of the sociology of education are the problems that have developed in more recent decades, and which are particular to the current age—an age with a distinctive institutional environment, and thus distinctive goals and aspirations for those who make educational policy.

With this in mind, we identify three separate problems for which international students have come to be understood as the solution, fueling the battle for the brains in the world's research universities. Our approach is guided by neoinstitutional theory in organizations,[4] historical institutional theory in politics,[5] and especially the understanding that there are historical contingencies and strategic choices, shaped by taken-for-granted scripts, rules, and institutional arrangements. Our focus is on the United States, but we discuss other states to show that this is a global phenomenon. Our goal is to show why policymakers came to see enrollment of international students, especially STEM students, as rational, why they did not make other choices, and why international student enrollment came to be taken for granted as the rational course of action.

One problem to be solved was: How to create a "world-class university"? This term, used often by scholars and policymakers, has no set meaning, but typically refers to a bundle of qualities relating to an institution's resources, recruitment, and overall quality.[6] It is part of a series of changes, highlighted by Davies and Mehta in chapter 1 of this volume, that has raised the stakes for success and made recruiting the best students even more competitive. Having a world-class university has become especially important to newly industrialized nations that are concerned about their status and want to raise their reputation on a global scale. These countries evince eagerness to show their excellence in education and highlight the modernity of their intellectual development. A reasonable way to show off a university to the world is to have the world come visit it. The basic ideas here have been developed in a series of studies on world culture and the expansion and standardization of higher education, especially curricula.[7] In a process that had

different start dates in different countries but is now widely established, universities and states perceived international students as a signal of their legitimacy and status in the global community. Global ranking services (see chapter 3 in this volume) then helped spread this "internationalization" of student bodies when they explicitly made it a part of their calculations—a high ranking was another signal of world-class status.

The second problem to be solved focused on domestic audiences: How to justify a university in neoliberal times? By "neoliberal," we mean the recent emergence of market rationalities in disparate and diverse social relations. Whatever the original justification for universities, and there have been many,[8] there can be little doubt that policymakers and education leaders have increasingly justified universities and education funding by reference to their contributions to economic growth, and thus to revenue generation.[9] Since many policymakers have come to see highly-educated STEM workers as the source of innovation, and innovation as the key to economic growth, attracting international STEM students has become part of this general economic orientation. The competition for STEM students has emerged as a response to the postindustrial economy long ago identified by Daniel Bell.[10]

The third problem that international students solve is related to these same changes in advanced industrial economies: How to pay the bills? Universities in many countries face decreasing proportions of government support for their expanding budgets. One obvious way that international students contribute to the solution is by paying tuition. The attraction to these students is especially pronounced in STEM, for complex reasons. Running a major research university is expensive, and maintaining labs and hiring the world-class faculty to staff them has become even more challenging than in the past. At the same time, funding for specific scientific projects with defined endpoints and deliverables is still plentiful. Rather than fight for more government core support, universities have adapted to the new fiscal environment, seeking to cut costs and generate revenue while still accepting project-based research funds. This has led universities to use international students (and here we include postdoctoral researchers, who are still being trained) for tuition funding and as inexpensive scientific labor. Another attractive feature of foreigners, at least doctoral students and PhDs in some STEM fields, is that they are willing to supply research labor power at low rates of pay as postdoctoral researchers in American university science laboratories. Universities pursue the international STEM students and postdocs, and governments create visa policy to enable this pursuit.

These choices that education policymakers are making are of great sig-

nificance, and relate to larger themes in this volume. One of these themes is inequality. When the willingness of international students to "pay to play" becomes a major pillar of university financing, local students may be squeezed out of opportunities simply because there are fewer spaces available to them. In other words, the local democratizing mission of some public institutions becomes compromised, and higher education is cast as an ostensibly public good that is most readily available to those who can pay.

We also wish to underscore the political "taken-for-granteds" that make these policy choices rational, and to establish limits and boundaries to the notion of international students as solutions, especially in STEM. One of these taken-for-granteds is the globalization of science, and an acceptance of advancing science and engineering in international teams financed in single countries, like the United States. This is rational only if policymakers perceive no national security threats, but those perceptions are subject to change. Consider, for example, the reevaluation of international student policies in the aftermath of the terrorist attacks of September 11, 2001.[11] The Department of State has maintained a "technology alert list" that limits the exposure of international students from countries determined to be sponsors of terrorism, including a major STEM-student sender, Iran.[12] If China were to be determined to be a similar threat, it could have major implications for American higher education, for reasons that will become clear below.

In this chapter, we first show that this battle for the brains is in fact occurring in universities in different countries in the world. We then explore the different ways that international students, especially though not exclusively in STEM, have become solutions to problems and are sought after in different countries. Our overall conclusion suggests that the contemporary pursuit of these students was not inevitable, and that it is shaped by strategic decisions in specific historical and institutional contexts.

Is There a Competition for Foreign Students?

Universities have commonly been international meeting places for both scholars and students.[13] The institutional environment spurring the contemporary and growing pursuit of international students began after World War II. As the historian Margaret O'Mara has shown, American efforts to attract international students were based on the notion that their presence in the United States would encourage cross-cultural understanding and contribute to peaceful relations. This was a major rationale of the Fulbright Act of 1946. But it was not all about sharing; foreigners studying in the United

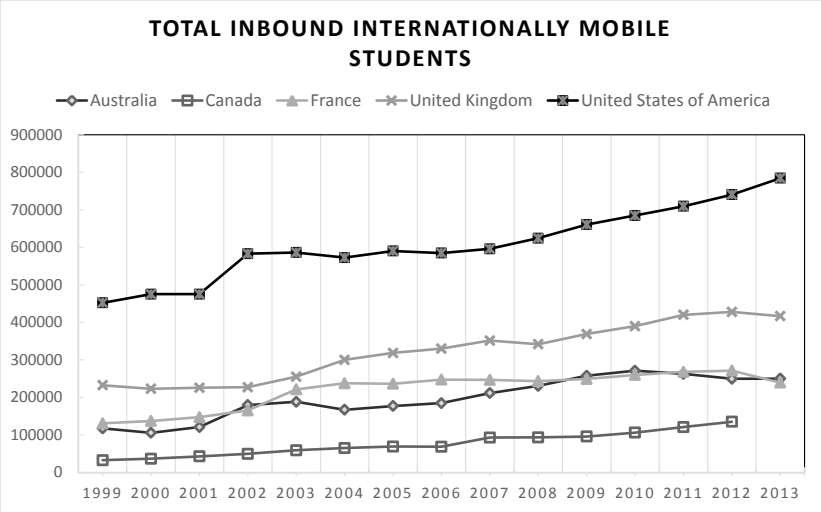

Figure 10.1. Source: UNESCO Global Flow of Tertiary-Level Students. Indicator: inbound internationally mobile students by continent of origin. Data accessed at http://data.uis.unesco.org/.

States, policymakers hoped, would see firsthand the superiority of American ways.[14] During the Cold War, the Soviet Union also sought to demonstrate openness to and build ties with other countries, especially in the developing world. To achieve this end, the government created the University of the Friendship of the Peoples, enrolling students primarily from Africa, Asia, and Latin America.[15]

Since the 1950s, the interest in recruiting international students has grown and spread. Their number is increasing worldwide, with some destinations seeing great increases in enrollments. As figure 10.1 shows, the United States remains the world leader in attracting international students, and despite a dip following the terrorist attacks of September 11, 2001, when visa policy tightened, the numbers have continued an upward trajectory, increasing from about half a million to nearly three-quarters of a million by 2008. Meanwhile, other key Anglophone destinations, the United Kingdom and Canada, have seen their numbers double over the decade.

Other data show the rise of multiple destinations for international students. Even while increasing in total numbers, the US share of the world total of international students declined by more than 5 percent in the first decade of the 2000s (see figure 10.2 and table 10.1). Other states increased their share, as the United Kingdom, the Russian Federation, and New Zealand made significant moves into this space.

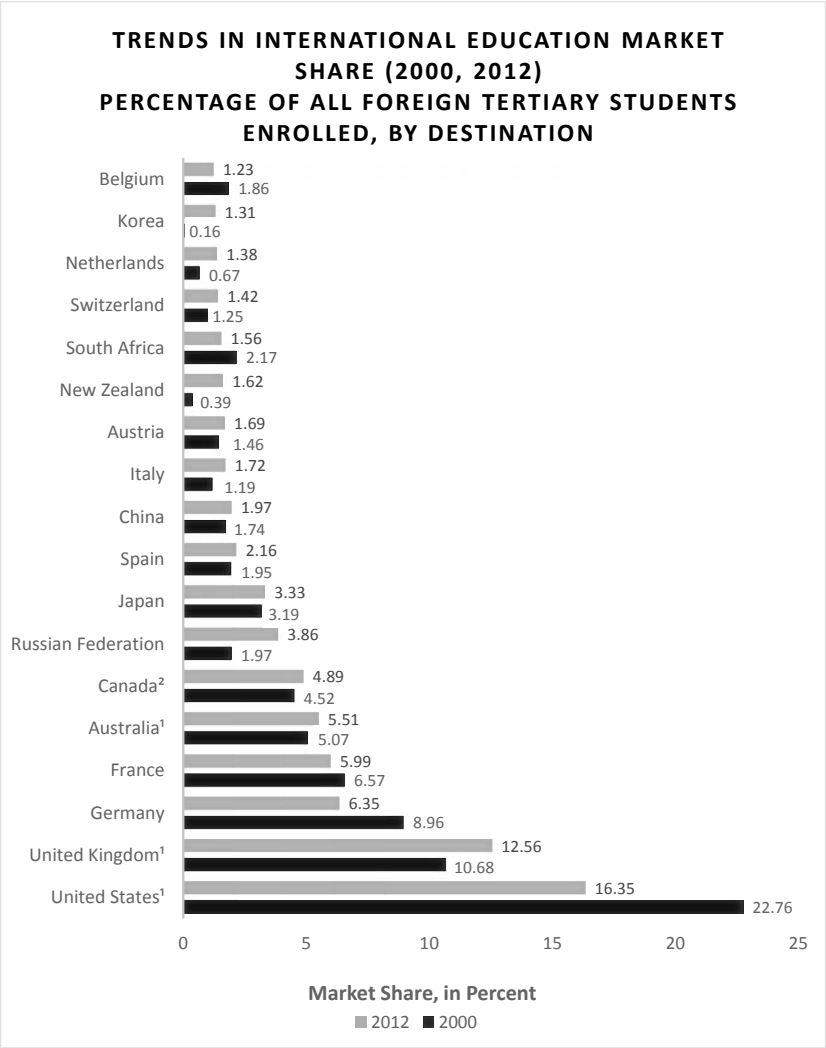

Figure 10.2. (1.) Data relate to international students defined on the basis of their country of residence. For the UK, data for 2012 is based on citizenship. (2.) Year of reference 2011 instead of 2012. Countries are ranked in descending order of 2012 market shares. Generated from "Education at a Glance, 2014." Organization of Economic Co-Operation and Development, OECD Publishing. Accessed at http://dx.doi.org/10.1787/eag-2014-en.

Table 10.1 Trends in International Education Market Share (2000–2012); percentage of all foreign tertiary students enrolled, by destination

	2000	2012		2000	2012
United States[1]	22.76	16.35	China	1.74	1.97
United Kingdom[1]	10.68	12.56	Italy	1.19	1.72
Germany	8.96	6.35	Austria	1.46	1.69
France	6.57	5.99	New Zealand	0.39	1.62
Australia[1]	5.07	5.51	South Africa	2.17	1.56
Canada[2]	4.52	4.89	Switzerland	1.25	1.42
Russia	1.97	3.86	Netherlands	0.67	1.38
Japan	3.19	3.33	South Korea	0.16	1.31
Spain	1.95	2.16	Belgium	1.86	1.23

Notes: (1.) Data relate to international students defined on the basis of their country of residence. For the UK, data for 2012 is based on citizenship. (2.) Year of reference 2011 instead of 2012.
Countries are ranked in descending order of 2012 market shares. Source: OECD, "Education at a Glance, 2014," Organization of Economic Co-operation and Development, OECD Publishing, accessed at http://dx.doi.org/10.1787/eag-2014-en.

Figures 10.3 and 10.4, focusing on the United States, provide understanding regarding the origins of these students. China, India, South Korea and Saudi Arabia are the major sending states of international students overall, while China towers above the rest if we focus only on doctoral students.

What do these students study? That depends on what level of student we are examining. Figures 10.5 and 10.6 show that undergraduate and master's international students focus mostly on business, with engineering in a distant second place. Figure 10.7 illustrates the focus of international doctoral students on—not surprisingly—engineering, with physics leading a crowded field of lesser choices.

Efforts to attract international students can be found across the globe, though we focus here on the major players by virtue of their success at attracting students from abroad. Other nations, though sometimes less successful, are nonetheless also notable for their major efforts to attract more students. In all cases, international students come not just because doors are opened, but because the students are actively courted.

For example, in 2011, the Canadian government announced funding to develop an international education strategy that sought to "reinforce Canada as a country of choice to study and conduct world-class research."[16] The subsequent report, "International Education: A Key Driver of Canada's Future Prosperity," culminated in a broad education strategy launched in 2014, a key priority of which aims to increase international student numbers.[17] Britain has been engaged with international student attraction for

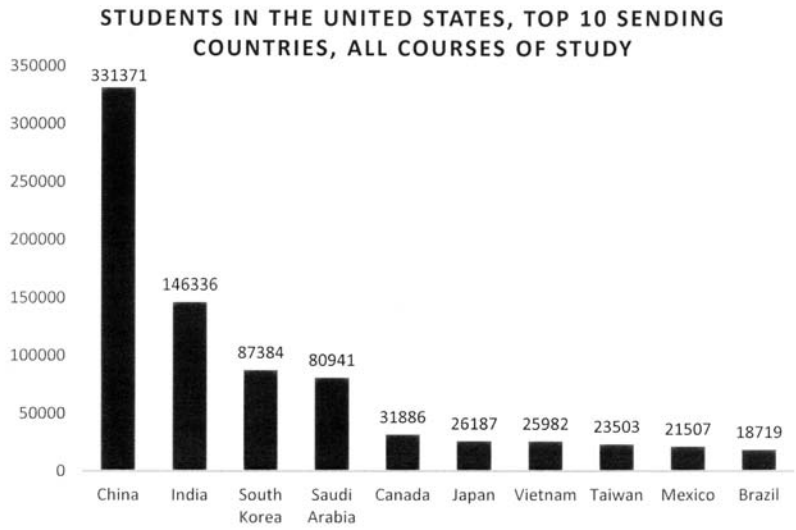

Figure 10.3. Generated from "SEVIS by the Numbers, February 2015: Real-Time SEVIS Data from February 6, 2015," US Department of Homeland Security. Accessed at http://studyinthestates.dhs.gov/sevis-by-the-numbers/february-2015.

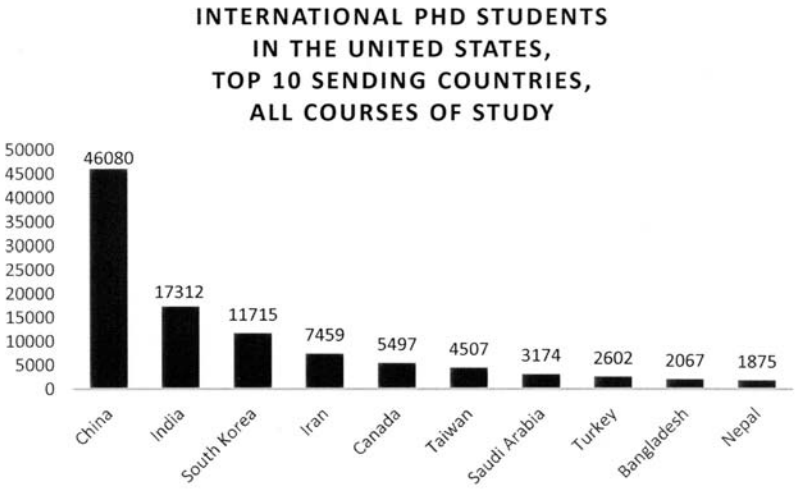

Figure 10.4. Generated from "SEVIS by the Numbers February 2015: Real-Time SEVIS Data from February 6, 2015." Accessed at http://studyinthestates.dhs.gov/sevis-by-the-numbers/february-2015.

Figure 10.5. Generated from Neil G. Ruiz, "The Geography of Foreign Students in U.S. Higher Education: Origins and Destinations," Brookings Institution, August 29, 2014. Accessed at http://www.brookings.edu/research/interactives/2014/geography-of-foreign-students#/M10420.

years: in 2006, British Prime Minister Tony Blair launched a £7,000,000 drive to attract a hundred thousand more international students to the United Kingdom by 2011. It followed a successful 1999 initiative that aimed to increase the number of international students in the UK's universities and colleges to seventy-five thousand by 2005.[18] France has also sought to increase the presence of foreign students and researchers in the country's higher education institutions. It has implemented a multipronged "strategy for attractiveness" by developing a national research agency to coordinate a nationwide international research program, significantly increasing the amount of funding for higher education and research.[19] The strategy aims to give French institutions of higher education greater autonomy to recruit

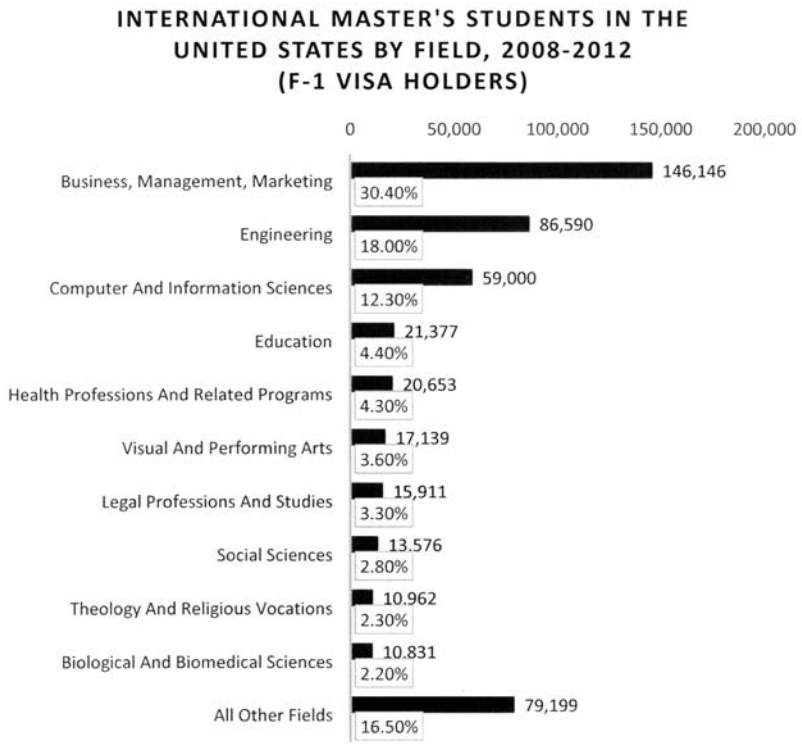

Figure 10.6. Generated from Neil G. Ruiz, "The Geography of Foreign Students in U.S. Higher Education: Origins and Destinations," Brookings Institution, August 29, 2014. Accessed at http://www.brookings.edu/research/interactives/2014/geography-of-foreign-students#/M10420.

the best talent, both domestically and from abroad, and to support foreign researchers at the country's national institutes.[20]

Similarly, in the early 2000s, an increasingly international turn in Australia aimed to make Australian institutions of higher education more competitive worldwide. More than three million international students have studied in Australia since the 1950s, and as of April 2015, 433,936 full-fee-paying international students were enrolled in Australia.[21] While successful marketing procedures have long lured international students to study in Australia, a new emphasis on bringing in higher-postgraduate students, paired with new visa opportunities extending additional points (Australia allocates visas on a point system to select the most desired visa applicants) to advanced-degree graduates from Australian institutions, has helped make Australia a destination for further study.[22]

Figure 10.7. Generated from Neil G. Ruiz, "The Geography of Foreign Students in U.S. Higher Education: Origins and Destinations," Brookings Institution, August 29, 2014. Accessed at http://www.brookings.edu/research/interactives/2014/geography-of-foreign-students#/M10420.

Though Asian states are especially prominent as senders of students, a growing number also seek to attract international students. For example, since the 1990s, the Singapore government has sought to make Singapore an education hub in Asia, or the "Boston of the East."[23] The "Global Schoolhouse" strategy, implemented in 2002, aimed to attract 150,000 international students by 2015, and to increase education's share of the GDP from 1.9 percent to 5 percent.[24] Singapore now requires institutions of higher education to maintain a foreign enrollment rate of over 20 percent to promote international education and exchange.[25] As one observer has commented, "No institution is more effectively focused on global competition than the National University of Singapore."[26]

Malaysia has also sought to become a major player in international higher education over the last two decades. It has gone from being the

world's third greatest exporter of international students in 1985 to being one of today's most promising destinations for international students.[27] In 2004, Malaysia hosted 32,000 international students, and by 2014, that number had jumped to 108,000.[28] Of these, 74 percent are undergraduates and 28 percent are postgraduate students. According to the government's official strategy, the "Malaysia Education Blueprint 2015–2025 (Higher Education)", the country aims to become a world leader in higher education by hosting 200,000 international students by 2020, and 250,000 by 2025.[29] In contrast to other countries that have looked to China and India for their traditionally high numbers of international students, Malaysian has specifically targeted countries of the Middle East and the Gulf states, with which it shares a Muslim heritage and which have newly mobile student populations.[30]

International Student Enrollment as a Signal of World-Class Status

To account for the rise of international students in the United States and in the world, we must first understand that some universities perceive international students as valuable because their presence signals legitimacy and membership in a global community. Work by John Meyer, Francisco Ramirez, and David John Frank, among others, has shown that universities have tended to follow cultural scripts that guide development in similar ways over time.[31] In the 2000s, having a robust international student body is part of the script to be followed if one wants to have a world-class university—and there is now a global rush to be a world-class university.[32] For many policymakers, having a world-class university benefits not only the university, but the entire country.

While this factor can be found worldwide, it may be especially prominent in countries that aspire to First World status and hope to rebrand themselves. For example, the Malaysia Education Blueprint suggests that increasing the number of international students contributes to developing Malaysia's "global prominence." As more students worldwide recognize Malaysia's high quality of institutions and value for money, the thinking goes, the country's higher-education institutions gain international respect. To achieve this, the country aims to further improve its course offerings for international students, and to develop a "green lane" immigration track for successful students, to give them an option to remain in the country after their graduation. As international students choose Malaysia for their studies, they further validate these institutional investments and burnish Malaysia's academic brand overseas.

Who is the audience for this signaling? Potential students, obviously, but others as well. One key audience is made up of the various organizations that rank the world's universities. In a commensuration process common in modern societies,[33] global university ranking systems have encouraged and focused desires of some states to have a world-class university.[34] They provide incentives to create research universities, since those are prioritized in global rankings, and the top ones tend to have large percentages of foreign graduate students, as well as foreign staff.[35] The ability to attract foreign students can also be a signal or indicator of the quality of research occurring at a university.[36]

Some prominent ranking systems therefore include the percentage of foreign students in their calculations.[37] For example, the QS World University Rankings bases five percent of its scoring on the international student ratio.[38] Similarly, the Times Higher Education World University Ranking bases 7.5 percent of its score on "international outlook: staff, students and research." Its methodology explains, "The ability of a university to attract undergraduates and postgraduates from all over the planet is key to its success on the world stage: this factor is measured by the ratio of international to domestic students and is worth 2.5 percent of the overall score."[39] When a razor-thin margin can determine top-ten or -twenty or -fifty status, even 2.5 percent is huge.

In a feedback loop, international students tend to rely on these rankings when they choose a university: "Rankings are a particularly critical factor when international students choose to study abroad because they may find it difficult to visit an institution in another country prior to making a college decision. Students, especially from Asian countries, are sensitive to rankings when they choose an international institution."[40] The more international students an institution has, the higher its ranking, and then the more international students it can attract.

The case of Taiwan illustrates how these institutional rules or scripts can affect an ambitious state or university's effort to become world-class. Aware of the importance of internationalization in global rankings of universities, the Taiwanese government sought to raise its visibility and global reputation by enhancing its position in the rankings. It therefore included the recruitment of international students in its 2003 National Development Plan. In 2004 the Taiwanese Ministry of Education created a "programme for expanding overseas student population" that subsidized university efforts to recruit international students—and then used international student recruitment as a measure of its own ranking of Taiwanese universities.[41]

International Students as a University Contribution to Economic Growth

International students, especially in STEM, also provide an answer to the problem of how universities can justify themselves in an era dominated by neoliberal (that is, market-based) rationalities and assumptions. Emphases on providing well-rounded, critically thinking citizens, or on enabling national defense, are not adequate. Universities must contribute something substantial to the economy, and policymakers in government and universities themselves have converged on the belief that students can contribute to future economic growth.[42] This perception may be more common in wealthier countries with postindustrial/knowledge economies, where innovation, and *technological* innovation in particular, is understood as the key to economic vitality.

In the context of knowledge-intensive, high-tech economies, universities or governments recruiting international students tend to focus on those majoring in STEM subjects.[43] As we have shown elsewhere,[44] this may appear uncontroversial and perfectly sensible, but on closer look, it appears to be guided more on faith or on a cultural script rather than on any empirical analysis or scientific basis.

First, even in the United States, a pioneer in the modern era in attracting international students, there is no research by the government or by social scientists that illuminates precisely how, which, or how many foreign students lead to economic growth. The causal linkage is certainly plausible, and these linkages are clear in basic science research, as all six US-based academic winners of Nobel Prizes in 2016 were foreign-born (two of these were former international students to the United States),[45] but the evidence to support this claim about economic growth and job creation remains unclear.

The basic theory that drives this economic growth argument for international students is "The more, the better."[46] This is a continuation of an old argument related to national security; during the 1950s and later, US government officials would count the number of scientists and engineers in the United States and compare that number, often unfavorably, with the number in the Soviet Union. There was never any proof that the number correlated with national security. Quality, rather than quantity, is the likely key variable.

Over the course of the 1980s, the threat changed from Soviet military power to Japanese economic power, and the goal of STEM policy became economic growth.[47] The notion of international STEM students being keys

for growth has been promoted by the high-profile 2005 report of the National Academies of Sciences, Engineering, and Medicine, which focused on American competitiveness and was ominously titled *Rising above the Gathering Storm*. The report stated, "Another challenge for US research institutions is to attract the overseas students on whose talents the nation depends."[48] It warned of other nations attracting STEM students, and argued for more efforts to bring them to the United States. The committee authoring the report included leaders of industry, STEM faculty from several other universities, and the presidents of Texas A&M University, Renssalaer Polytechnic Institute, Yale University, University of Maryland at College Park, and the past president of MIT.

Other states are indeed seeking international students, especially in STEM, for the same reasons. The United Kingdom, which is the United States' closest competitor in attracting international students, works to attract them for similar reasons. British Council chair Lord Kinnock, a former president of Cardiff University, emphasized the importance that the push for international students at the undergraduate and graduate levels had toward providing a "direct contribution to . . . economic and technological development."[49] At the time, Kinnock reported 39 percent of all postgraduate research in the United Kingdom was done by non-UK postgrads, and that their research and teaching contributed significantly to that nation's "knowledge economy."[50]

In early 2014, Canadian Prime Minster Stephen Harper launched Canada's International Education Strategy," which was subtitled "Harnessing our Knowledge Advantage to Drive Innovation and Prosperity." The fact that this initiative was launched by the Canadian minister for international trade, and not the country's minister of education, suggests that universities may be assigned their economic role in admitting international students as much as choosing it themselves. International Trade Minister Ed Fast described the international education strategy as the "blueprint to attract talent and prepare our country for the 21st century."[51]

The strategy of recruiting international students to augment economic growth is also prominent in countries trying to move into the ranks of the most developed. For example, it figures prominently in up-and-coming Malaysia's rationale for increasing international student enrollments. According to the Malaysia Education Blueprint, international students, especially PhDs, will help develop a greater in-country supply of talent that can contribute toward Malaysia's innovation ecosystem. Maintaining that country's growing innovation sector requires the acquisition and development of human capital talent, including international students.[52]

A final way in which international students help justify universities is through simple consumption power: they spend a lot in host economies. A report by the National Association of International Educators on the 2013–2014 academic year found that the 886,000 international students and their families supported 340,000 jobs and contributed $26.8 billion to the US economy.[53] International education is a significant driver for the Australian economy, and is the country's largest services export. Education exports are the country's fourth largest export, following iron ore, coal, and gold.[54] Education for international students contributed A$16.3 billion to the Australian economy in 2013–2014, and supported 130,000 jobs nationally.[55] In 2012, the Canadian government estimated the country's 265,400 international students spent a total of C$8.4 billion in local communities, and generated $455 million in federal and provincial tax revenues. Furthermore, these students helped to sustain nearly 87,000 Canadian jobs.[56]

International Students as Tuition Payers and Inexpensive Scientific Labor

The third major problem for which international students are the solution is how to pay the campus bills. It is beyond the scope of this chapter to explore why higher education now costs so much, and why state government expenditures have not grown with the costs. The key point is that both public and private research universities have responded to the tight fiscal environment and limitations created by existing political institutions by seeking other sources of revenue and ways to cut costs—all while continuing and increasing their research missions.

In recent years, the pursuit of undergraduate students from China has become a growth industry in the United States, as these students pay high fees and may help support campuses.[57] Graduate students are also major sources of revenue.[58] Australia provides a dramatic example: over the past five years, international students have contributed A$18.5 billion towards Australian universities, which helps to support staff, teaching, and research outputs. These fees further help to provide university access to domestic Australian students by lowering education costs, contributing 16 percent of all university revenues in 2012.[59]

The other way in which international students (and, increasingly, postdocs) help pay bills is more complex, and reflects changes developing over several decades in the cost structures of universities, the willingness of different populations to seek education and training in STEM, and the availability of funding for research. Put simply, the problem is that universities

are engaging in more research than ever before (though federal funds have declined, industry funds have increased),[60] but the chances of achieving a full-time faculty post in science and engineering are increasingly small. Given the funding-rich research environment, this means that students and postdocs must do more work, mostly for existing faculty, even while they face uncertain futures in academia.

If that is the simple explanation, understanding why the academic job market is so weak is complex. Economist Paula Stephan notes four main reasons.[61] First, the pool of PhDs in science and engineering has grown, both in the United States and abroad. While the number of male American citizens earning STEM PhDs has been stable or declining, that number has been going up among women citizens and temporary and permanent residents. If both US and other universities are producing PhDs at greater numbers, then there will simply be more candidates chasing a very few full-time tenure-track employment opportunities.

Second, universities have chosen to rely on non–tenure-track faculty, who receive low pay and benefits, over expensive tenure-track faculty.[62] This trend has occurred over several decades, but by 2001, 35 percent of faculty at public universities and 40 percent of faculty at private universities were non–tenure-track.

Third, hiring dried up because state governments fund public institutions less generously than they used to. Part of the problem was the 2008 financial crisis, which choked off tax revenues as incomes declined and people lost their jobs. But some of these wounds are self-inflicted, and reflect political choices: states have responded to political incentives to put more money in popular investments such as prisons and health care. Stephan reports that state funds for universities, adjusted for inflation and enrollments, fell by 11 percent between 1970 and 2005. This trend has continued in the wake of 2008's Great Recession. In 2016, state appropriations for higher education average 18 percent less per student than they did before the recession hit, and only four states—Montana, North Dakota, Wisconsin, and Wyoming—were spending more.[63] In what some observers have called a privatization of public higher education,[64] state funds have declined so that they only support 4 percent of the budget at the University of Washington, 6.3 percent at the University of Michigan, and 9.4 percent at Pennsylvania State University.

Finally, start-up packages for new STEM hires can be very high, and so each new scientist is a major investment. The University of California, San Francisco, for example, informs its new hires what to expect and what to request: start-up funds for new assistant professors of biology average between $308,000 (at public universities) and $403,000 (at private univer-

sities).[65] If every new professor is a major investment, and if universities do not have resources to make many such investments, then they will hire fewer of them.

While this is primarily a story for the United States, Stephan notes that universities abroad have not increased their hiring to pick up the slack. For example, the average age of assistant-professor equivalents in Italy is forty-five. In 2010, comprehensive reforms to the Italian university system largely removed opportunities for tenure for new academic staff, resulting in a 12-percent decline in tenured faculty from 2008 to 2012.[66] Further educational reforms elsewhere in Europe have contributed to an increasing share of temporary contracts and part-time positions for new academic staff. In South Korea, part-time faculty outnumber full-time faculty.[67]

The great number of openings for graduate students and postdocs, coupled with the scarcity of faculty positions, has created a bottleneck at the postdoc stage as STEM workers increasingly have long postdoc positions, or multiple postdocs, before they can get a full-time job.[68] According to one recent National Academies report, the situation is gloomy, has been for a long time, and is getting worse. The problems are many: a lack of visibility on campus, a lack of prestige, a lack of research independence, a lack of adequate pay, and a lack of adequate mentoring. In 2010, median pay for postdocs in science, engineering, and health up to five years after earning a degree was $43,000; for comparable workers *not* in postdoc positions, it was $76,000.[69]

A major problem with the increase in postdoctoral fellowships is that it is increasingly common for PhDs to do not just one but multiple postdocs in the hope of attaining a full-time job in science. This means that the low wages associated with academic postdocs may continue for several years after the PhD, leading to lost wages and delayed lives; the average age of someone hired for their first tenure-track job has been in the range of thirty-five to forty for several years.[70] The issue was a focus of another dreary and pessimistic National Academies report on "the arc of the academic research career"—dreary because, though most PhDs surveyed knew that only about 15 percent of PhDs in science and engineering had tenure-track jobs five years after receiving their degrees, about half or more (depending on the field) of those who preferred academic careers thought they would be one of the lucky ones.[71]

In this context, migration theory predicts that foreigners who face blocked opportunities and poor wage prospects will move to open and better opportunities. That appears to be what has happened. In the United States, foreign students and postdoctoral researchers comprise a sizable per-

Table 10.2 Top ten most popular graduate courses of study, by citizenship 2013

US citizens and permanent residents		Temporary residents	
Political science	42,018	Computer science	32,148
Psychology, other	26,441	Electrical engineering	30,670
Computer science	24,191	Mechanical engineering	11,296
Preventive medicine and community health	21,414	Chemistry	8,683
Psychology, general	15,041	Civil engineering	8,662
Electrical engineering	14,892	Economics (except agricultural)	8,172
Chemistry	14,266	Mathematics and applied mathematics	6,792
Social sciences, other	14,097	Physics	6,407
Speech pathology and audiology	13,717	Political science	6,393
Mechanical engineering	12,791	Industrial engineering	6,357
Agricultural sciences	12,773	Chemical engineering	5,068

Data source: NSF-NIH survey of graduate students and postdoctorates in science and engineering, info via WebCaspar. Analysis variable: number of graduate students, academic discipline (detailed).

centage of all STEM enrollments and research positions, showing higher numbers in STEM than in non-STEM fields, and outnumbering native students considerably in certain fields (see table 10.2). Between 1970 and 2005, the number of US citizens earning PhDs in engineering declined 23 percent, in the physical sciences 44 percent, and in math 50 percent. The overall numbers of Americans earning STEM PhDs in this period fell from 3,547 in 1970 to 1,986. The best students appeared to leave STEM for fields where wages were 5 to 15 percent higher, such as finance and accounting.[72] Meanwhile, temporary US visa holders came to comprise a majority of graduate students in a number of fields. For example, in 2013, foreign graduate students made up 51 percent of all graduate engineering students, and within some fields the numbers are even higher. Foreign graduate students comprise 73 percent of all enrolled petroleum engineers, and 67 percent of all electrical engineers. Temporary visa holders are 57 percent of all computer science graduate students.[73]

The federal government has also created numerous visa categories that can be used to fill postdoc positions, thus making it difficult to assess the dependence on immigrants.[74] With this caveat in mind, some data indicate that the United States has seen a steady increase in its postdoctorate population, from 19,000 in 1982 to more than 40,000 in 2001 (see figure 10.8).[75] By 2013, the National Science Foundation's comprehensive Survey of Graduate Students counted 61,942 postdoctoral appointees in science, engineering and health fields.[76] Of that total, less than half, 29,546, were US citizens or permanent residents. The remainder were temporary visa holders.

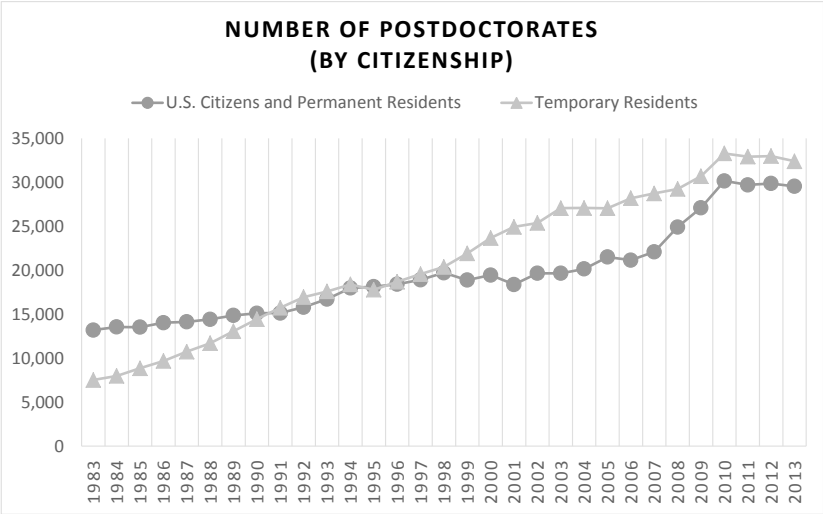

Figure 10.8. Data Source: NSF-NIH Survey of Graduate Students & Postdoctorates in Science and Engineering Info, via WebCaspar. Analysis variable: number of postdoctorates (type of doctorate degree, by citizenship) [sum].

Conclusion

We have argued that increasing international student enrollments serves several goals in the contemporary era. It is an indicator of "world-class" status, and an entrée into the global community of advanced nations. It is a way to show that universities are contributing to the local and state economies and are propelling future growth, especially if the students study STEM subjects. Finally, international students and postdoctoral researchers are simply a way to pay the bills and maintain the research enterprise, given the funding environment and the costs of doing science.

Given these institutional forces shaping the drive for international students, it is likely that this pursuit will continue for the foreseeable future. We have shown how universities around the world have adopted common scripts for international success, and how foreign students can contribute toward addressing specific challenges. In a globalized world, universities that teach and train only local students will look parochial and backward. And, given perceptions of the importance of economic growth and how to achieve it, as well as cost pressures, international students will likely serve domestic goals as well.

We also emphasize that the rationality of these policy choices is contingent upon historical context and therefore could change. In the 2010s,

public institutions in the United States find it acceptable to leverage the willingness of international students to pay their way, thus limiting the opportunities of local students to enroll—but a political movement could close off this acceptability. Similarly, research universities' reliance on international students to conduct cutting-edge research in STEM fields could end if policymakers render this globalized science approach to be a threat to national security.

For sociologists studying higher-education policy, the lesson of neo-institutional theory in organizations and of historical institutional theory in the study of politics is that policymakers operate in historically bounded cultural and relational contexts. The job of the sociologist is to reveal why choices appear rational to those making the choices, and why patterns repeat across seemingly diverse contexts.

Notes

1. Richard B. Freeman and Daniel L. Goroff, Introduction to Freeman and Goroff, eds., *Science and Engineering Careers in the United States: An Analysis of Markets and Employment* (Chicago: University of Chicago Press, 2009), 1–16.
2. John Bound, Sarah Turner, and Patrick Walsh, "Internationalization of U.S. Doctorate Education," in Richard B. Freeman and Daniel L. Goroff, eds., *Science and Engineering Careers in the United States: An Analysis of Markets and Employment* (Chicago: University of Chicago Press, 2009), 59–97.
3. For a review, see Hans de Wit, *Internationalization of Higher Education in the United States and Europe: A Historical, Comparative, and Conceptual Analysis* (Westport, CT: Greenwood Press, 2002), chapter 5.
4. John W. Meyer and Brian Rowan, "Institutionalized Organizations: Formal Structure as Myth and Ceremony," *American Journal of Sociology* 83, no. 2 (September 1977), 340–363; Frank Dobbin, *Forging Industrial Policy: The United States, Britain and France in the Railway Age* (New York: Cambridge University Press, 1994).
5. See, for example, Theda Skocpol and Paul Pierson, "Historical Institutionalism in Contemporary Political Science," in Ira Katznelson and Helen V. Milner, eds., *Political Science: State of the Discipline* (New York: W. W. Norton; 2002), 693–721.
6. Rui Yang and Anthony Welch, "A World Class University in China? The Case of Tsinghua," *Higher Education* 63 (2012): 645–666.
7. David John Frank and Jay Gabler, *Reconstructing the University: Worldwide Shifts in Academia in the 20th Century* (Stanford, CA: Stanford University Press, 2006).
8. Clark Kerr, *The Uses of the University*, Fifth Edition (Cambridge, MA: Harvard University Press 2001 [1963]).
9. Derek Bok, *Higher Education in America* (Princeton, NJ: Princeton University Press, 2013); Sheila Slaughter and Gary Rhoades, *Academic Capitalism and the New Economy: Markets, State, and Higher Education* (Baltimore: Johns Hopkins University Press, 2004); Steven Brint, "Creating the Future: 'New Directions' in American Research Universities." *Minerva* 43 (2005): 23–50.
10. Daniel Bell, *The Coming of Post-Industrial Society* (New York: Basic Books, 1973).

11. James H. Johnson Jr., "U.S. Immigration Reform, Homeland Security, and Global Economic Competitiveness in the Aftermath of the September 11, 2001 Terrorist Attacks," *North Carolina Journal of International Law and Commercial Regulation* 419 (2002): 419–464.
12. Janice Jacobs, "Foreign Students and Scholars in the Age of Terrorism," testimony before the Committee on Science US House of Representatives, March 26, 2003, accessed at https://2001–2009.state.gov/r/pa/ei/othertstmy/33002.htm.
13. Edward Charnwood Cieslak, *The Foreign Student in American Colleges: A Survey and Evaluation of Administrative Problems and Practices* (Detroit: Wayne State University Press, 1955).
14. Margaret O'Mara, "The Uses of the Foreign Student," *Social Science History* 36 (2012): 583–615.
15. Martin Ebon, *The Soviet Propaganda Machine* (New York: McGraw-Hill, 1987), 275–276.
16. Advisory Panel on Canada's International Education, "International Education: A Key Driver of Canada's Future Prosperity" (Foreign Affairs, Trade, and Development Canada), accessed at http://www.international.gc.ca/education/advisory-consultation.aspx?lang=eng.
17. "Canada's International Education Strategy: Harnessing Our Knowledge Advantage to Drive Innovation and Prosperity" (proposal by Foreign Affairs, Trade, and Development Canada, 2014), 4. Accessed at http://international.gc.ca/global-markets-marches-mondiaux/assets/pdfs/overview-apercu-eng.pdf.
18. Elaina Loveland, "Opening Doors to the United Kingdom: An Interview with British Council Chair Lord Kinnock," *International Educator* (November-December 2006): 20–24. Accessed at https://nafsa.org/_/File/_/lordkinnockvoices111206.pdf.
19. "A Strategy for Attractiveness: Incentive Pprograms Implemented" (proposal by France Diplomatie 2010). Accessed at http://www.diplomatie.gouv.fr/en/coming-to-france/studying-in-france/receiving-foreign-students-in/a-strategy-for-attractiveness/.
20. http://www.agence-nationale-recherche.fr/en/project-based-funding-to-advance-french-research/.
21. Australian Government Department of Education and Training, "Monthly Summary of International Student Enrolment Data1—Australia—YTD April 2015." Accessed at https://internationaleducation.gov.au/research/International-Student-Data/Documents/Monthly%20summaries%20of%20international%20student%20enrolment%20data%202015/04_April_2015_MonthlySummary.pdf.
22. Christopher Ziguras and Siew Fang Law, "Recruiting International Students as Skilled Migrants: The Global 'Skills Race' as Viewed from Australia and Malaysia," *Globalisation, Societies and Education* 4 (2006): 59–76.
23. Hena Mukherjee and Poh Kam Wong, "The National University of Singapore and the University of Malaya: Common Roots and Different Paths," in Philip G. Altbach and Jamil Salmi, eds., *The Road to Academic Excellence: The Making of World-Class Research Universities* (Washington: World Bank, 2011), 129–166, 148.
24. Drewe, Vicki. "Singapore's Global Schoolhouse Strategy: The first Ten Years." Presentation at the Australian International Education Conference 2012. Accessed at http://aiec.idp.com/uploads/pdf/2012_drewe_thu_1140_219.pdf.
25. *The International Mobility of Students in Asia and the Pacific* (Paris: United Nations Educational, Scientific and Cultural Organization, Bangkok Office, 2013). Accessed at

http://www.uis.unesco.org/Library/Documents/international-student-mobility-asia-pacific-education-2013-en.pdf.

26. Simon Marginson, "Dynamics of National and Global Competition in Higher Education," *Higher Education* 52 (2006): 20.
27. *"The International Mobility of Students in Asia and the Pacific* (Paris: United Nations Educational, Scientific and Cultural Organization, Bangkok Office, 2013), 49. Accessed at http://www.uis.unesco.org/Library/Documents/international-student-mobility-asia-pacific-education-2013-en.pdf.
28. "The Malaysia Education Blueprint 2015–2025 (Higher Education)," Kementerian Pendidikan Malaysia, April 2015. Accessed at http://hes.moe.gov.my/event/docs/3.%20Malaysia%20Education%20Blueprint%202015–2025%20%28Higher%20Education%29.pdf.
29. "The Malaysia Education Blueprint 2015–2025 (Higher Education)."
30. *The International Mobility of Students in Asia and the Pacific*, 57. Accessed at http://www.uis.unesco.org/Library/Documents/international-student-mobility-asia-pacific-education-2013-en.pdf.
31. See, for example, John W. Meyer, Francisco Ramirez, David John Frank and Evan Schofer, "Higher Education as an Institution," in Patricia J. Gumport, ed., *Sociology of Higher Education: Contributions and the Contexts* (Baltimore: Johns Hopkins University Press, 2007), 187–221.
32. David P. Baker, *The Schooled Society: The Educational Transformation of Global Culture* (Stanford, CA: Stanford University Press, 2014), 87.
33. Wendy Nelson Espeland and Mitchell L. Stevens, "Commensuration as a Social Process," *Annual Review of Sociology* 24 (1998), 313–343.
34. Ka Ho Mok and Kar Ming Yu, "Introduction: The Quest for Regional Hub Status and Transnationalization of Higher Education: Challenges for Managing Human Capital in East Asia," in Ka Ho Mok and Kar Ming Yu, eds., *Internationalization of Higher Education in East Asia: Trends of Student Mobility and Impact on Education Governance* (New York: Routledge, 2014), 1–26, 22.
35. Hugo Horta, "Global and National Prominent Universities: Internationalization, Competitiveness, and the Role of the State," *Higher Education* 58, no. 3 (2009): 387–405.
36. Simon Marginson, "Dynamics of National and Global Competition in Higher Education," *Higher Education* 52, no. 1 (2006): 1–39.
37. For a discussion, see Jamil Salmi, *The Challenge of Establishing World-Class Universities* (Washington: World Bank Publications, 2009), 5–6.
38. Quacquarelli Symonds, "QS World University Rankings: Methodology," last modified September 12, 2014. Accessed at http://www.topuniversities.com/university-rankings-articles/world-university-rankings/qs-world-university-rankings-methodology.
39. Times Higher Education, "World University Rankings 2014–15." Accessed at https://www.timeshighereducation.co.uk/world-university-rankings/2015/world-ranking#tab-ranking-methodology.
40. Jung Cheol Shin and Robert K. Toutkoushian, "The Past, Present, and Future of University Rankings," in Jung Cheol Shin, Robert K. Toutkoushian and Ulrich Teichler, eds., *University Rankings: Theoretical Basis, Methodology and Impacts on Global Higher Education*. Volume 3 (New York: Springer Science & Business Media, 2011), 1–16.
41. William Yat Wai Lo, *University Rankings: Implications for Higher Education in Taiwan* (New York: Springer, 2014).

42. Roger L. Geiger, *Knowledge and Money: Research Universities and the Paradox of the Marketplace*. Stanford, CA: Stanford University Press, 2004).
43. Jane Knight, "Education Hubs: Focus on Student Mobility, Human Resource Development and Knowledge Production," in Ka Ho Mok and Kar Ming Yu, eds., *Internationalization of Higher Education in East Asia: Trends of Student Mobility and Impact on Education Governance* (New York: Routledge, 2014), 27–41.
44. John D. Skrentny and Natalie Novick, "From Science to Alchemy? The Progressives' Deployment of Expertise and the Contemporary Faith in Science to Grow the Economy and Create Jobs," in Stephen Skowronek, Bruce Ackerman and Stephen Engel, eds., *The Progressives' Century: Democratic Reform and Constitutional Government in the United States* (New Haven: Yale University Press, forthcoming).
45. Elizabeth Redden, "America's Immigrant Laureates," *Inside Higher Education*, October 11, 2016. Accessed at https://www.insidehighered.com/news/2016/10/11/foreign-born-professors-account-us-nobel-haul.
46. On the "myth of infinite benefit" of science, see Daniel R. Sarewitz, *Frontiers of Illusion: Science, Technology, and the Politics of Progress* (Philadelphia: Temple University Press, 1996), chapter 2.
47. Skrentny and Novick, "From Science to Alchemy?"
48. Committee on Prospering in the Global Economy of the 21st Century and Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington: National Academies Press, 2007), 78–79.
49. Loveland, Elaina, "Opening Doors to the United Kingdom." *International Educator* (2006): 20–24.
50. Loveland, "Opening Doors to the United Kingdom," 20–24.
51. "Canada's International Education Strategy: Harnessing Our Knowledge Advantage to Drive Innovation and Prosperity" (proposal by Foreign Affairs, Trade, and Development Canada, 2014). Accesssed at http://international.gc.ca/global-markets-marches-mondiaux/assets/pdfs/overview-apercu-eng.pdf.
52. "The Malaysia Education Blueprint 2015–2025 (Higher Education)."
53. NAFSA (National Association of Foreign Student Advisers) International Student Economic Value Tool, accessed at http://www.nafsa.org/Explore_International_Education/Impact/Data_And_Statistics/NAFSA_International_Student_Economic_Value_Tool/. On student spending in the UK, see "The Economic Costs and Benefits of International Students" (2013), a report by Oxford Economics for the University of Sheffield. Accessed at https://www.shef.ac.uk/polopoly_fs/1.259052!/file/sheffield-international-students-report.pdf.
54. Group of Eight Australia, "International Students in Higher Education and Their Role in the Australian Economy,", March 2014. Accessed at https://go8.edu.au/sites/default/files/docs/publications/international_students_in_higher_education_and_their_role_in_the_australian_economy.pdf.
55. "Draft National Strategy for International Education (for Consultation)," report by the Australian Ministry for Education and Training (April 2015), 5. Accessed at https://internationaleducation.gov.au/International-network/Australia/InternationalStrategy/Documents/Draft%20National%20Strategy%20for%20International%20Education.pdf.
56. "Canada's International Education Strategy: Harnessing our knowledge advantage to drive innovation and prosperity," 7. Accessed at http://international.gc.ca/global-markets-marches-mondiaux/assets/pdfs/overview-apercu-eng.pdf.

57. Matt Schiavenza, "The Tenuous Relationship between American Universities and Chinese Students," *Atlantic*, May 30, 2015. Accessed at http://www.theatlantic.com/education/archive/2015/05/american-universities-are-addicted-to-chinese-students/394517/#chinese%20students. However, international students can raise costs as well, as they have special needs and not all universities and colleges make money from them. See also Brendan Cantwell, "Are International Students Cash Cows? Examining the Relationship between New International Undergraduate Enrollments and Institutional Revenue at Public Colleges and Universities in the US," *Journal of International Students* 5, no. 4 (September-October 2015): 512–525.
58. "The Economic Costs and Benefits of International Students," report by Oxford Economics for the University of Sheffield (2013). Accessed at https://www.shef.ac.uk/polopoly_fs/1.259052!/file/sheffield-international-students-report.pdf.
59. Group of Eight Australia, "International Students in Higher Education and Their Role in the Australian Economy," March 2014. https://go8.edu.au/sites/default/files/docs/publications/international_students_in_higher_education_and_their_role_in_the_australian_economy.pdf.
60. Roger L. Geiger, *Knowledge & Money: Research Universities and the Paradox of the Marketplace* (Stanford, CA: Stanford University Press, 2004), chapter 4; see also David P. Baker, *The Schooled Society: The Educational Transformation of Global Culture* (Stanford, CA: Stanford University Press, 2014).
61. Paula Stephan, *How Economics Shapes Science* (Cambridge, MA: Harvard University Press, 2012), 170–171.
62. On this point, see also James D. Adams, "Is the United States Losing Its Preeminence in Higher Education?" in Charles T. Clotfelter, ed., *American Universities in a Global Market* (Chicago: University of Chicago Press and National Bureau of Economic Research, 2010), 33–68.
63. Michael Mitchell, Michael Leachman, and Kathleen Masterson, "Funding Down, Tuition Up," Center on Budget and Policy Priorities, August 15, 2016. Accessed at http://www.cbpp.org/sites/default/files/atoms/files/5–19–16sfp.pdf.
64. Thomas G. Mortenson, "State Funding: A Race to the Bottom," American Council on Education, Winter 2012. Accessed at http://www.acenet.edu/the-presidency/columns-and-features/Pages/state-funding-a-race-to-the-bottom.aspx.
65. "Negotiating your Start Up Package," Office of Career & Professional Development, University of California, San Francisco. Accessed at https://career.ucsf.edu/sites/career.ucsf.edu/files/PDF/ResearcherNegotiatingStartupPackage.pdf.
66. Davide Donina, Michele Meoli, and Stefano Paleari. 2015. *Higher Education Policy*. Springer. 28:215–234.
67. Stephan, *How Economics Shapes Science*, 171–172.
68. Michael S. Teitelbaum, *Falling Behind? Boom, Bust & the Global Race for Scientific Talent* (Princeton, NJ: Princeton University Press, 2014), 164.
69. Committee to Review the State of Postdoctoral Experience in Scientists and Engineers and Committee on Science, Engineering and Public Policy, *The Postdoctoral Experience Revisited* (Washington: National Academies Press, 2014), 27.
70. Beryl Lieff Benderly, rapporteur, and Committee on Science, Engineering and Public Policy, *The Arc of the Academic Research Career: Issues and Implications for U.S. Science and Engineering Leadership: Summary of a Workshop* (Washington: National Academies Press, 2014), 19. See also P. E. Stephan and J. Ma, "The Increased Frequency and Duration of the Postdoctorate Career Stage," *American Economic Review* 95, no. 71 (2005).
71. Benderly and Committee on Science, Engineering and Public Policy, *Arc of the Aca-*

demic Research Career, 21–22. Here the report discussed the important work of Henry Sauermann and Michael Roach, "PhD Students' Plans to Pursue Postdoctoral Training and Subsequent Transitions Into Postdoc Positions," unpublished manuscript.

72. Eric Bettinger, "To Be or Not to Be: Major Choices in Budding Scientists," in Charles T. Clotfelter, ed., *American Universities in a Global Market* (Chicago: University of Chicago Press and National Bureau of Economic Research, 2010), 69–98.
73. "Graduate Students in Science, Engineering, and Health in All Institutions, by Detailed Field, Citizenship, Ethnicity, and Race: 2013," Fall 2013 Survey of Graduate Students and Postdoctorates in Science and Engineering, National Science Foundation. Accessed at http://ncsesdata.nsf.gov/datatables/gradpostdoc/2013/html/GSS2013_DST_21.html.
74. For examples of how universities navigate hiring postdoctorate researchers, see University of Wisconsin https://www.ohr.wisc.edu/polproced/UPPP/0102_D.pdf or Stanford http://icenter.stanford.edu/docs/scholars/H1-J1-Visa-Comparison.pdf and http://postdocs.stanford.edu/admin/how-to/visas.html#h1b.
75. Philippe Moguérou, "Doctoral and Postdoctoral Education in Science and Engineering: Europe in the International Competition," *European Journal of Education* 40 (2005): 367–392.
76. National Science Foundation, "Postdoctoral Appointees in Science, Engineering, and Health in All Institutions, by Field, Citizenship, Ethnicity, and Race: 2007–13," Fall 2013 Survey of Graduate Students and Postdoctorates in Science and Engineering. Accessed at http://ncsesdata.nsf.gov/gradpostdoc/2013/html/GSS2013_DST_34.html.

PART THREE

Old Themes, New Perspectives