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SUMMARY

In recent years, the presence of immigrants has increased in almost all high-skilled occupations in the United States. According to Census 2000, one of every five doctors in the country is foreign born, as are two of every five medical scientists; one of every five computer specialists; one of every six persons in engineering or science occupations; one of every four astronomers, physicists, chemical, and material scientists; and one of every six biological scientists. In certain skilled professions, such as nursing, the presence of foreign-born workers is likely to grow much more in future. However, there is no automatic route through which foreign-born, high-skilled workers can become permanent residents. A majority attains permanent status through family unification. As globalization and increasing international demand for skilled professionals create incentives for skilled workers to migrate to other countries, the absence of a policy that allows easy employment-linked permanent residence status in the United States may deter foreign-born professionals from staying in the country.

Legislators appear to be responding to the changing global realities. Recent Senate legislation, for instance, proposes increasing employment-based green cards to 450,000 per year over the course of the next ten years from the current 140,000.

The Contributions of High-Skilled Immigrants

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Thousands of highly skilled engineers and scientists — as well as thousands of low-skilled workers — enter the United States every year to enjoy the fruits of its vibrant economy and the excellence of its institutions of higher education.[1] In turn, research suggests, the foreign born make the US economy more diverse, productive, and innovative and its labor force younger and more creative.[2] In the past two decades, immigrant presence has increased in almost all high-skilled and low-skilled occupations.

Immigrants to the United States are far from homogeneous. They are heavily concentrated at opposing ends of the education distribution: one-third do not even have high school degrees while approximately one-quarter have a college degree or higher education.[3] Estimates from the National Science Board underscore the economy's dependence on highly skilled foreign workers. In 2000, the foreign born constituted approximately 17 percent of the work force with

a BA degree in science and engineering occupations, 29 percent of those with a master's degree, and 39 percent of those with a doctoral degree. In comparison, the foreign born made up 11 percent of the US population and 15 percent of the overall workforce. Plainly, high-skilled immigrants are a critical resource for the knowledge-driven economy and play an important role in the country's global dominance in science and engineering and its leadership in technology.[4]

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The Policy Context

Experts have faulted US immigration policy for the emphasis it places on the social goal of family unification versus the goal of promoting the nation's economic competitiveness. Before 1990, only about 10 percent of green cards for legal permanent residents were issued in the employment or occupation category. In 1990, the government more than doubled the immigration quota for the employment/occupation categories. Partly as a result of this change in policy and partly due to increases in the issuance of H-1B visas (temporary visas issued to high-skilled foreign workers), recent waves of immigrants have been more educated and skilled than ever before.[5]

However, even increased inflows of skilled professionals since 1990 do not appear to satisfy the economy's demand for talent. The annual quota for H-1B visas, for instance, is often filled by the middle of the year, and no new H-1B visas can be issued for the rest of the year.[6] Further, while the number of temporary visas has fluctuated in recent years — in part in response to changing levels of demand — the number of permanent employment visas has remained fixed since 1990, despite changes to the economy that require more skilled professionals.

In the last three decades, the United States has attracted and absorbed more skilled workers than any other industrialized country. However, changes in the global labor market for the highly skilled are eroding US dominance in science and engineering.[7] Beset with aging populations and growing demand for skilled workers, other industrialized countries and some emerging economies are creating or expanding institutions for higher education, in turn, increasing international options of high-skilled professionals. These trends hint that the United States may cease to be the most attractive destination for internationally mobile, high-skilled workers.

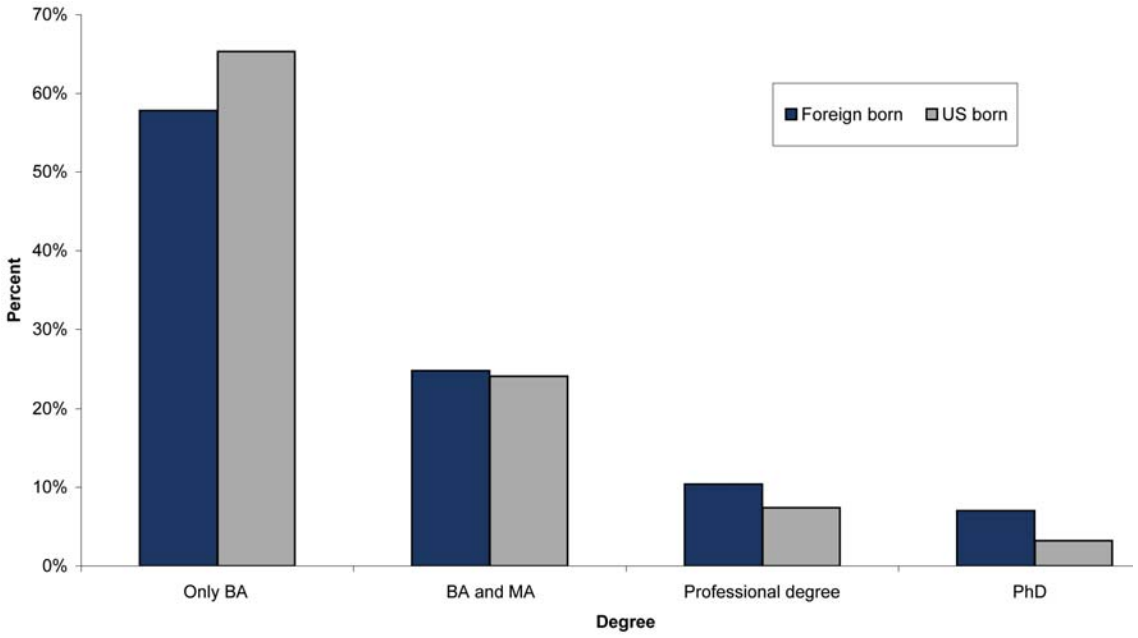
These trends raise a number of policy questions. How should the United States adapt its immigration policy to the new realities of the global labor market for skilled professionals? Should access to permanent legal status be made easier and more certain for successful students and skilled workers? Many of these issues are addressed in Senate proposals for comprehensive immigration reform that would raise the number of employment-based green cards to 450,000 a year from the current 140,000 over the course of the next ten years. After 2016, according to the proposed bill, these numbers would be lowered to 290,000.

This paper presents a profile of high-skilled professionals to provide background for policy discussion on the contributions of skilled professionals to the US economy. We do so by examining the occupational profiles of highly skilled immigrants and by exploring how they enter the country, where they come from, and what kind of talent they bring. We also look at their contributions to the US economy, their effects on various sectors and groups of workers, and their patterns of assimilation into the US economy.

Occupational Profile

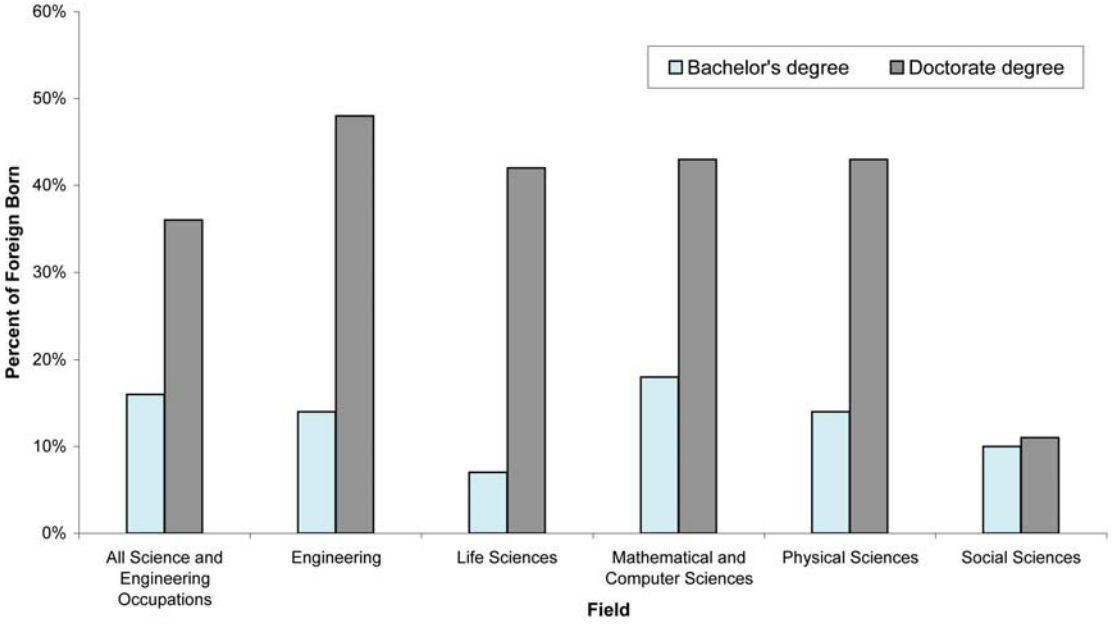
For the purpose of this Insight, we define high-skilled workers as persons with at least a Bachelor's degree (BA).[8] Among high-skilled professionals, the foreign born are more likely to have an advanced degree than the US-born (Figures 1 and 2). For instance, a little over 10 percent of the foreign born with at least a BA degree also have a professional degree and 7 percent hold PhDs. The corresponding proportions for the US-born are 7 and 3.2 percent, respectively.

Figure 1. Dominance in the Ivory Towers: Foreign-Born Population More Likely to Have Advanced Degrees than US-Born Population (% of Persons Age 25 or Older with at Least a BA Degree)



Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

Figure 2. Foreign-Born Share Grows with Education (Census Estimates of the Foreign Born in US Science and Engineering Occupations by Field, 2000)



Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

In recent years, immigrant presence has increased in almost all high-skilled occupations. According to the Current Population Survey in 2004, 24 percent of immigrants who arrived during the 1980s had a BA or an advanced degree. In comparison, 27 percent of immigrants arriving in the 1990s and 34 percent of those who entered since 2000 had a college degree in 2004 (Table 1). Overall, foreign-born persons comprised 8 percent of the skilled US population age 25 or over in 1990, 13 percent in 2000, and 15 percent in 2004. These rising yet broad averages, however, mask the vital presence of immigrants in certain occupations. For instance, according to Census 2000, one in every five doctors in the country, one in five computer specialists, and one in six persons in engineering or science occupations is foreign born (Table 2).

Immigrants are also heavily represented in occupations that may be considered sensitive for security purposes (Table 3). According to Census 2000 data, 17 percent of aerospace engineers; 12 percent of nuclear engineers; and 14 percent of petroleum, mining, geological, and industrial engineers are foreign born. These latter groups include people working in occupations relating to environment, health, and safety. Foreign-born persons hold key

Table 1. Educational Attainment of the US- and Foreign-Born Population 25 Years and Over, 2004 (% of total)

Level of Education	Foreign Born by Year of Entry					All Foreign Born	US Born	Total % (Foreign Born plus US Born)
	Before 1970	1970-1979	1980-1989	1990-1999	2000-2004			
Without a Bachelor's degree	76.4	71.1	75.7	73.4	65.7	72.7	72.2	72.3
Bachelor's degree	12.7	18.8	15.5	17.3	22.2	17.1	18.2	18.1
Advanced degree (more than a BA)	10.9	10.1	8.9	10.3	12.1	10.2	9.5	9.6

Note: Columns do not always add up to 100 due to rounding.
Source: US Census Bureau, Current Population Survey, Annual Social and Economic Supplement, 2004; http://www.census.gov/population/www/socdemo/foreign/ppl-176.html, Tables 1.5 and 2.7.

Table 2. Proportion of the Foreign Born in High-Skilled Occupations, 1990 and 2000 (% of the total Foreign-Born Population)

Occupation	Proportion Foreign Born %		Proportion of the Foreign Born Recently Arrived (in the United States less than 6 years) %	
	1990	2000	1990	2000
Managerial professionals	7.3	9.6	1.2	1.8
Business and finance specialists	7.7	10.4	1.3	1.9
Computer specialists	11.2	19.2	2.3	6.4
Engineers and architects	11.8	15.7	2.1	3.1
Life, physical and social science occupations	10.6	18.5	3.1	5.9
Education, training, and library occupations	5.9	7.9	1.7	2.2
Doctors	16.6	21.6	2.3	3.6
Other health specialists	8.2	10.9	1.5	1.4
Health support professionals	10.1	14.0	2.6	2.7
Services (excluding health services)	9.0	11.3	2.8	3.0
Administrative occupations	7.5	9.4	1.5	1.7
Sales occupations	7.5	10.3	1.5	2.0
Production	10.5	13.6	2.6	2.8

Note: Figures are proportions of the foreign born in the high-skilled work force (those with at least a BA degree) in each occupation; samples restricted to those aged 25 to 64 years. Authors' computation.
Source: US Census 1990, 2000, based on the 5 percent extracts of the Integrated Public Use Microdata series (IPUMS).

Table 3. Share of the Foreign-Born in High-Skilled Occupations with a Bearing on National Security, 2000 (% of the total Foreign-Born Population)

Occupation	Proportion Foreign Born US Citizens %	Proportion Foreign Born Non-citizens %	Proportion Foreign Born Total %
Engineering occupations			
Aerospace engineers	13.1	3.7	16.8
Chemical engineers	9.8	7.1	16.9
Civil, computer, electrical, and electronics engineers	13.4	8.8	22.3
Industrial engineers (including environmental, health, and safety)	8.3	6.1	14.4
Material and mechanical engineer	10.5	8.3	18.8
Marine engineer	7.3	2.3	9.6
Nuclear engineer	8.9	3.3	12.2
Petroleum, mining, and geological engineer (including mining safety engineers)	5.1	6.3	11.4
Miscellaneous (including agriculture and biomedical)	13.4	9.7	23.2
Scientists (life, physical, and social science)			
Agriculture and food scientists	4.1	6.4	10.5
Astronomers and physicists	11.0	14.9	25.9
Atmosphere and space scientists	4.5	3.2	7.7
Biological scientists	6.9	9.4	16.3
Chemists and material scientists	13.9	10.9	24.8
Environmental scientists and geoscientists	3.8	3.8	7.6
Medical scientists	11.0	33.3	44.4
Social science research assistants and nuclear technicians	7.8	14.4	22.1
Transportation			
Aircraft pilots and flight engineers	2.5	1.9	4.4
Air traffic controllers and airfield operations specialists	4.7	2.4	7.1
Military specific occupations	4.0	2.1	6.1

Note: Figures are proportions of the foreign born in the high-skilled work force (those with at least a BA degree) in each occupation; samples are restricted to those aged 25 to 64 years. Occupation categories pertain to the Census 2000 occupation code.
Authors' computation.
Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

positions in physical, social, and life science occupations as well, constituting 19 percent of all workers holding such jobs.

Even these large proportions of immigrants in the sciences understate the broad presence of foreign-born scientists in certain fields. For instance, two out of every five medical scientists in the country are foreign born; as is one in four astronomers, physicists, chemical and material scientists; and one in six biologists. Approximately a third of the foreign born in occupations relating to physical, social, and life sciences, as well as computer sciences, are recent arrivals who entered the country after 1995.

Two of every five medical scientists in the country are foreign born; as is one of every four astronomers, physicists, chemists and material scientists; and one of every six biologists.

Entry into the United States

There are essentially three modes of entry to the United States for the high skilled. One is through the permanent immigration system that sets aside roughly 140,000 visas annually for high-skilled immigrants and their families (the

140,000 ceiling applies to both "principals" and their family members).

High-skilled workers also enter as temporary workers with H-1B visas issued to professional workers employed in specialty occupations. The number issued has fallen from 195,000 in 2000 to the current level of 65,000. (Unlike the permanent visa system family members are *not* included in the cap.) In recent years, about 50,000 to 70,000 visas have also been issued annually under category L visas, to allow intra-company transfers of high-level managers in multinational corporations with operations in the United States.

The third important, if indirect, route to becoming a member of the high-skill workforce is as a graduate student or as a postdoctoral scholar.[9] Most foreign students and scholars enter the country with either an F1 visa, issued to full-time students, or a J1 visa issued to students and scholars in a field of specialized knowledge that enables them to participate in specialized training programs. During 2000-2004, between 600,000 and 700,000 persons a year entered the country on students' visa.

Finally, some immigrants who enter without inspection or, more likely, overstay their student, worker or tourist visas, find ways to adjust status and make up a significant portion of high-skill workers. According to estimates by the Pew Hispanic Center, there are approximately 1 million unauthorized immigrants with at least a BA in the United States today.

There are three primary options for foreign students who want to stay in the United States after finishing their training: acquire a job and obtain an H-IB visa; become a permanent resident by marrying a US citizen or permanent resident; or live without authorization.[10] Paral and Johnson[11] estimate that a quarter of H-1B visa holders in 1999 were students previously enrolled in American universities. Around 114,000 scientists and engineers adjusted visa status from temporary non-immigrant to permanent resident status in the 1990s by obtaining employment visas. This modest number suggests that a significant share of scientists and engineers who adjust from temporary to permanent status do so under the family unification and not via the employment provisions of the Immigration Act.

Origin and Destinations of High-Skilled Immigrants

Since the early 1970s, the source of high-skilled foreign-born workers in the United States has shifted from Europe to Asia. Within Asia, an increasing number of immigrants come from South Asia and China. Within Europe the origin of immigrant inflows has shifted from industrialized northern and southern Europe to the emerging economies of Central Europe. In 2000, 29.4 percent of the foreign born who entered the United States before 1970 were from southern and northern Europe; and 24.5 percent from Asia. In contrast, among those who arrived in the 1990s, 47 percent were from Asia and 11.2 percent from southern and northern Europe (Table 4). The proportion from Central Europe almost doubled from 5.9 percent prior to the 1970s to 11.3 percent during the 1990s. During this same period, the proportion of high-skilled arrivals from the Caribbean declined from 12.4 to 3.8 percent. The decline in skilled immigration from industrialized countries to the United States has coincided

Table 4. Foreign-Born High-Skilled Immigrants, by Country of Birth and Year of Arrival, 2000

Country or Region*	Total	Period of Arrival in the United States			
		1991-2000	1981-1990	1971-1980	Before 1971
Mexico	4.9	5.0	5.3	4.6	4.6
Caribbean	6.3	3.8	6.2	7.2	12.4
Central America	2.3	1.6	3.2	2.2	2.3
South America	6.1	6.8	6.2	5.0	5.7
Canada & the Pacific	4.6	4.7	3.0	3.6	9.0
North Europe	10.3	9.5	7.0	7.2	23.3
South Europe	2.3	1.7	1.3	2.4	6.1
Central Europe (inc. Russia)	7.7	11.3	5.9	4.3	5.9
Middle East & North Africa	6.6	5.1	7.2	9.7	5.3
Rest of Africa	3.6	3.9	4.5	3.8	1.1
South Asia	12.7	16.5	12.2	11.6	4.7
Philippines	9.3	7.5	11.7	11.5	6.7
Korea & Japan	7.3	7.8	6.8	9.2	4.0
China, Hong Kong & Singapore	10.7	11.3	12.8	9.2	7.4
Rest of Southeast Asia	5.1	3.6	6.5	8.5	1.7

* Regions are based on the 2000 US Census Bureau categories.
Note: The high-skilled are defined as individuals with at least a BA degree. Columns do not always add up to 100 due to rounding.
Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

with a growing demand in Europe and the Pacific for international skilled workers and with countries in the European Union and Asia increasing investment in creating universities for science and engineering.

Individuals from different regions of the world have built professional niches in the US economy (Table 5). For instance, according to Census 2000, 16 percent of all foreign-born persons in managerial occupations were from northern Europe, followed by 11 percent from South Asia, and 10 percent from China (including Hong Kong and Taiwan). Almost 30 percent of all foreign-born computer specialists were born in South Asia and another 20 percent in China. About a fourth of all foreign-born doctors were from South Asia,[12] and over one-tenth from the Middle East or North Africa. One-quarter of immigrants in health support occupations[13] were from the Philippines, nearly 15 percent from Central Europe, and 10 percent from the Caribbean.

High-skilled immigrants show as much diversity in their choice of residence within the United States as in their region of origin. High-skilled immigrants are more likely than the low-skilled to live outside of ethnic communities or enclaves. They are also more likely to be geographically dispersed within the United States, and more likely to migrate internally. Kaushal and Kaestner find that Chinese and Indian immigrants with BA degrees are 25 to

Table 5. Distribution of Immigrants in High-Skilled Occupations by Source Country, 2000

Country or Region*	% Managerial	% Business & Finance Specialists	% Computer Specialists	% Engineers	% Scientists	% Teachers	% Doctors	% Other Health Specialists	% Health Support Occupations
Mexico	3.7	3.4	1.4	2.8	2.1	7.2	2.5	2.0	4.9
Caribbean	6.3	7.9	2.6	3.8	2.7	8.3	5.6	7.9	10.9
Central America	1.8	2.0	0.8	1.2	0.8	2.6	1.3	1.5	3.3
South America	6.6	5.7	3.1	4.1	4.6	7.1	5.5	4.6	5.6
Canada and the Pacific	6.8	4.7	3.0	4.0	5.2	6.7	5.1	5.3	2.3
North Europe	16.2	10.3	6.9	9.2	13.4	15.0	6.9	7.0	4.9
South Europe	3.2	2.4	1.1	2.0	2.9	4.3	2.2	1.4	1.0
Central Europe (inc. Russia)	5.9	5.7	9.5	8.6	8.5	7.1	6.1	5.4	14.7
Middle East and North Africa	8.0	5.5	4.5	9.4	5.1	6.8	10.8	6.2	3.9
Rest of Africa	3.3	4.4	2.5	2.6	3.0	3.8	4.3	5.0	6.1
South Asia	11.2	10.8	29.6	15.1	13.0	7.7	23.7	14.8	6.5
Philippines	4.9	11.7	4.5	6.4	4.3	3.3	8.2	23.0	27.1
Korea and Japan	8.0	6.4	3.6	4.8	6.6	6.6	5.4	4.7	2.8
China, Hong Kong and Taiwan	10.1	12.7	19.7	16.6	23.1	10.4	7.8	6.6	3.7
Rest of Southeast Asia	4.0	6.5	7.1	9.6	4.5	3.2	4.7	4.6	2.6

* Regions are based on the 2000 US Census Bureau categories.
Note: Columns do not always add up to 100 due to rounding.
Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

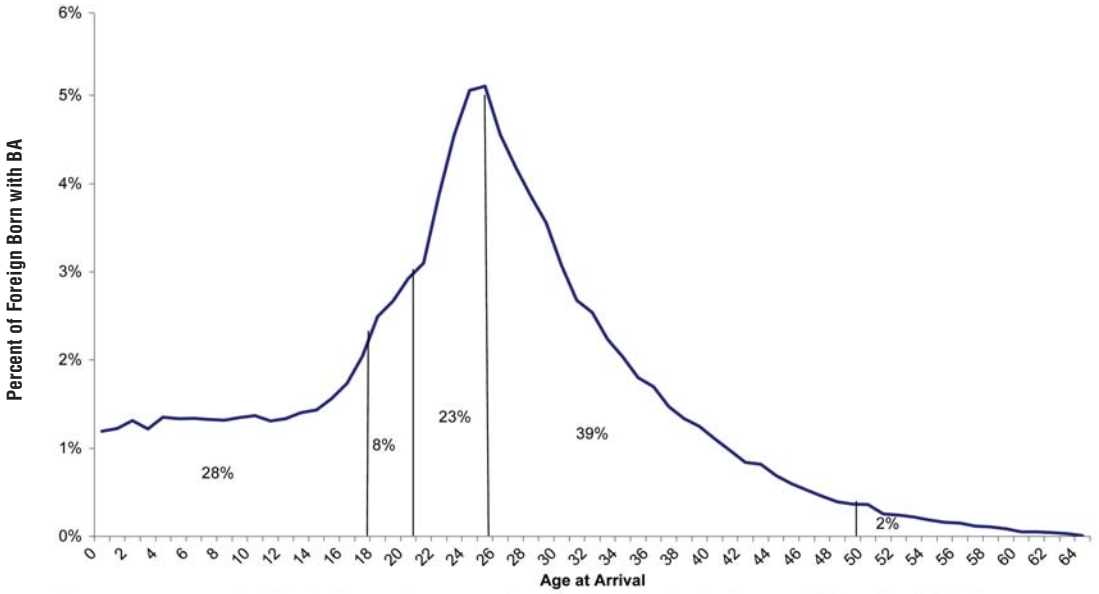
50 percent more likely to move across states compared to those with less than a high school degree.[14] Since high-skilled immigrants are less attracted to ethnic networks, they are more likely to live in new growth centers versus traditional gateway cities.

Educational Attainment of the Foreign Born

The educational foundations of most foreign-born high-skilled professionals in the United States are established in their home country. According to Census 2000, close to 80 percent of the high-skilled immigrants in the United States entered the country after they had turned 18, and about two-thirds entered after they turned 21 (Figure 3). If age at arrival is used as an indicator of education level at entry, the statistics cited above suggest that only a fifth of the high-skilled immigrants received elementary and high-school education in the United States, and about two-thirds received at least some college education in a country other than the United States. In 2000, more than half the foreign-born persons with a professional degree or a PhD who entered the country came at age 25 or later (Figures 4, 5, and 6), suggesting that many had some sort of work experience or at least a master's degree earned in a country other than the United States. A large number of international graduate students, trained abroad in areas such as medicine and engineer-

According to Census 2000, close to 80 percent of the high-skilled immigrants in the United States entered the country after they had turned 18, and about two-thirds entered after they turned 21.

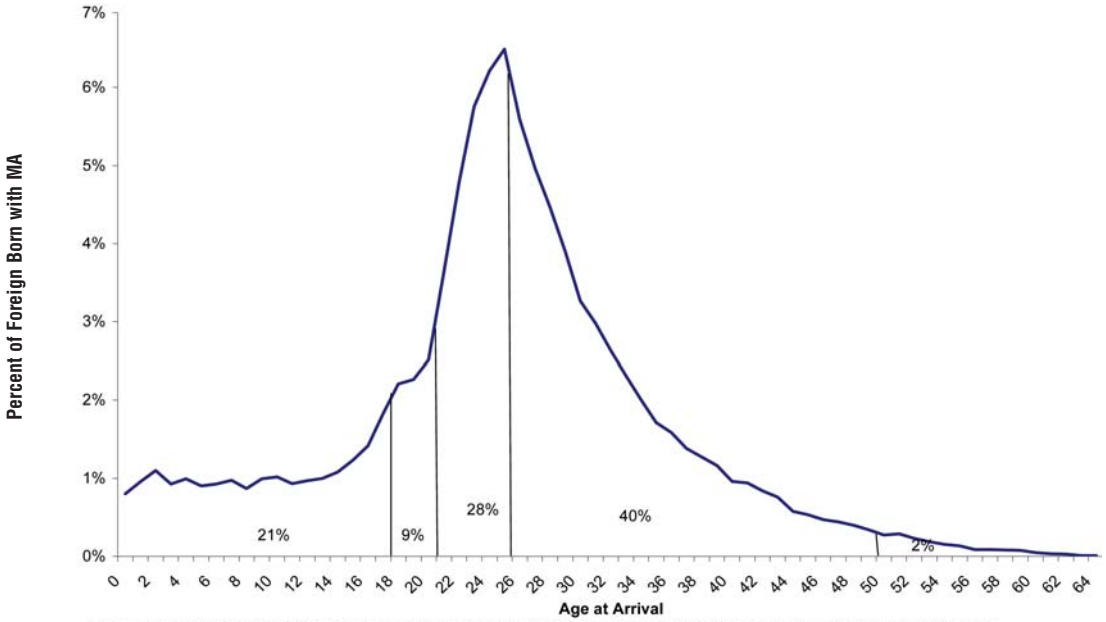
Figure 3. Distribution of the Foreign-Born with a BA Degree, by Age at Arrival



Percentages expressed within the line graph represent the proportion of the foreign-born population with a Bachelor's degree. For example, those who arrived between ages 0 and 18 years of age represent 28 percent of the total foreign-born population with a Bachelor's degree.

Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

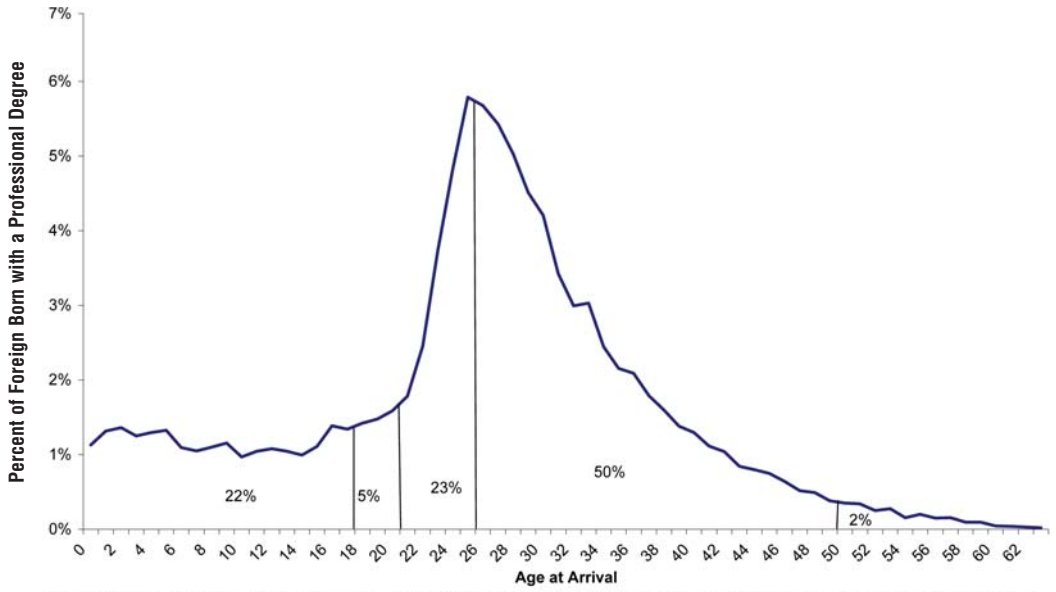
Figure 4. Distribution of the Foreign Born with a Master's Degree, by Age at Arrival



Percentages expressed within the line graph represent the proportion of the foreign-born population with a Master's degree. For example, those who arrived between ages 0 and 18 years of age represent 21 percent of the total foreign-born population with a Master's degree.

Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

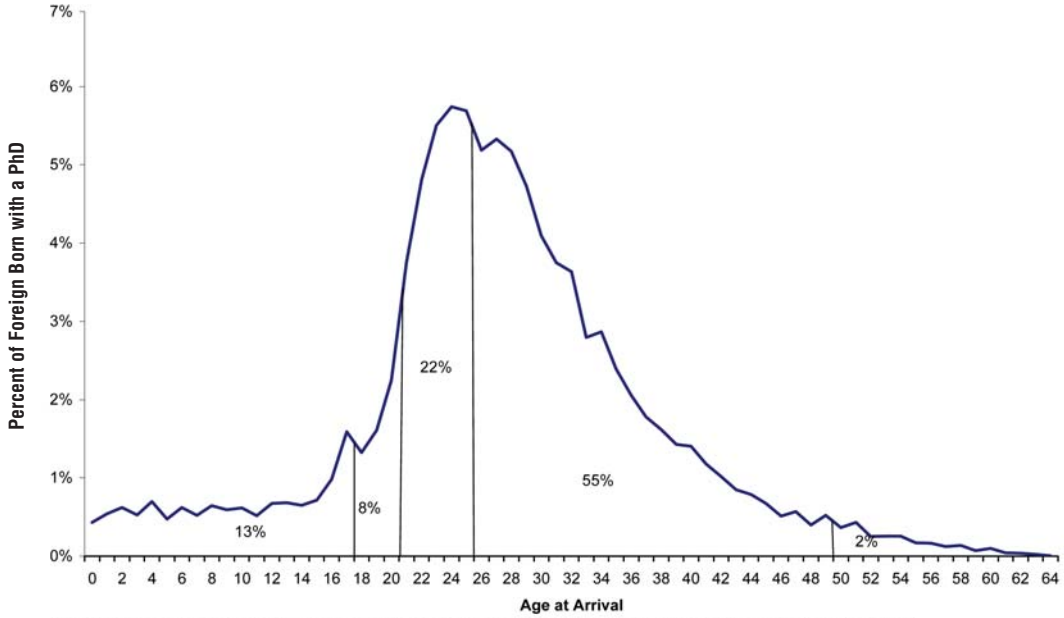
Figure 5. Distribution of the Foreign-Born with a Professional Degree (e.g. MD, DDS, DVM, LLB, JD), by Age at Arrival



Percentages expressed within the line graph represent the proportion of the foreign-born population with a professional degree. For example, those who arrived between ages 0 and 18 years of age represent 22 percent of the total foreign-born population with a professional degree.

Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

Figure 6. Distribution of the Foreign-Born with a PhD Degree, by Age at Arrival



Percentages expressed within the line graph represent the proportion of the foreign-born population with a PhD. For example, those who arrived between ages 0 and 18 years of age represent 13 percent of the total foreign-born population with a PhD.

Source: US Census 2000, based on the 5 percent extracts of the Integrated Public Use Microdata Series (IPUMS).

ing enter directly into technical occupations as doctors, nurses, computer consultants, and engineers. In short, while the US economy benefits from the services of these foreign-born skilled professionals, it invests much less in their education as compared to the investment it makes in the training and education of US-born professionals.

While foreign-born scholars bring with them knowledge acquired in their country of origin, many develop their skills further by studying in American universities and research institutions. In 2003, for instance, foreign-born students earned almost two-fifths of all science and engineering doctorates and, more specifically, three-fifths of the engineering doctorates awarded in the United States. In 2002, 59 percent of the approximately 47,000 science and engineering post-doctoral scholars in the country were temporary residents, up from 37 percent two decades ago.[15] At the very least, these data make clear that the foreign born, who compose 11 percent of the total US population, are heavily over-represented in the science and engineering graduate programs and the US workforce. These patterns in turn beg the question whether the highly skilled foreign born have a negative impact on native workers and students.

Impacts on Native-born Workers and Students

Immigration has complex, sometimes ambiguous impacts on natives. The benefits to the US economy from high-skilled immigration can be accompanied by negative effects for certain groups of natives and positive effects for other groups. As is clear from the preceding profile, high-skilled immigrants are heterogeneous. Like immigrants, US-born workers also have diverse skills and occupations. The interaction between the two heterogeneous populations produces a complex array of outcomes. Understanding the complexities of the economic relationships between native-born and immigrant workers is key to delineating the impact of high-skilled immigration on natives.

Within a narrowly defined occupation category, immigrants and natives are likely to compete. Across different occupations, however, they may complement each other in some cases and compete in others. For instance, an influx of foreign-born doctors will increase competition for native-born doctors, but it will also increase demand for the services of other native-born health professionals, improving economic opportunities for the latter. Unfortunately, most research on the labor market effects of immigration has ignored cross-occupation effects.

Research on the effects of immigration on native workers also suffers from conceptual and data-related problems. Most studies use what is referred to as the cross-market comparison, in which uneven spatial distribution of newly arrived immigrants in cities, regions or states is used to estimate the effect of immigrant arrivals on wages in local labor markets. This approach often assumes that immigration decisions are largely unrelated to wages in the destination. In reality, immigrants may move to areas where there is high demand for their services and thus better pay. But researchers must resolve whether immigrants are going to locations with high growth or whether the local economy is booming because of immigration.

There are other methodological challenges to isolating the impact of immigration on native wages. If immigration to an area is driving natives to migrate out of that area, the estimated effect of immigration on native wages would be diffused. A related issue involves the question of whether natives who move are responding to immigrant inflows by leaving local labor markets or whether other economic developments are driving them to leave. Finally, the local economy may also adjust to immigrant inflows by increasing production and trade of goods and services primarily manufactured by immigrants, in which case, it would be difficult to measure the effect of immigrant inflows on wages. For instance, inflows of computer specialists during the 1990s contributed to the creation of a large number of IT companies in Silicon Valley, resulting in northern California becoming one of the largest exporters of computer services nationally and globally.

In addition to these conceptual issues, there is the question of how to measure immigrant inflows. Most studies have used census data on immigrant inflows during the previous five or ten years, a period long enough for the local economy to adjust to the increased supply of immigrants, by, say, increasing exports of goods and services produced by the immigrants in question.

Within these methodological limitations, some researchers have found that immigrant inflows have had only a modestly negative effect on the wages of natives.[16] Others have used theoretical models, which assume that immigrants and natives only compete, to imply that immigrant inflows in recent decades have had large adverse effects on native wages.[17] The focus of most of these studies is either on immigrants of all skill levels, treated as homogenous entities, or on low-skilled immigrants only.

There is relatively limited research on the effects of high-skilled immigration on natives. Using a theoretical framework that assumes that immigrants and natives compete, Borjas found that a 10 percent increase of immigrants with PhDs in a certain field lowered the wages of native born graduating with doctorates in those same fields around the same time by 3 percent, and part of the decline could be attributed to increased prevalence of post-doctoral appointments in fields that have "soft labor market conditions."[18] In another study, Borjas finds that immigration between 1980 and 2000 depressed the wages of college graduates by 4.9 percent — less than the level of wage depression for high school dropouts (8.9 percent) but more than that of natives with high school degrees or some college education.[19] Zavodny, on the other hand, found that an inflow of H-1B professionals did not depress wages of IT workers, nor did it affect their current unemployment rates.[20] Batalova finds that the presence of a larger share of immigrants in the same job is associated with higher earnings for most skilled men and women. She also finds, however, that there is a tipping point beyond which increased immigrant presence in jobs is associated with a decline in earnings for all workers.[21]

Researchers have also examined the degree to which high inflows of foreign-born students affect the educational opportunities of native students. Borjas finds some evidence that an inflow of foreign-born students displaces native, white male students in elite institutions,

but has no effect on US-born students in general. Freeman, Jin, and Shen, on the other hand, do not find any displacement effects of the inflow of foreign-students on US students.[22] Using graduate applications and admissions data, the 2005 National Research Council (NRC) study reaches the same conclusion; it finds that after September 11, 2001, the number of international student applications and admissions fell dramatically, but domestic student applications remained constant and admissions actually declined. The authors argue that if international students displaced domestic students, a decline in international applications and admissions would have resulted in an increase in domestic applications and admissions.

Along similar lines, Bean and Brown find that native male enrollment in graduate science and engineering programs rose in 2000 at the same time that international student enrollments were also rising — a finding inconsistent with the competition hypothesis. Bean and Brown contend that the size of the native cohort aged 20-24 and working conditions in graduate programs (pay levels, length of graduate study) may be more powerful explanations of native enrollment patterns than the presence of international students.[23]

All told, then, evidence suggests that the striking overrepresentation of international students in graduate programs in sciences and engineering have limited to no effects on native students' admissions. There is some evidence of limited adverse impacts on the high skill labor force — especially within jobs with high concentrations of foreign workers

Supply of Immigrant Talent, Capital, and Entrepreneurs

From an economic point of view, an important aspect of immigration is the addition of skills that are not in abundance in the host country. A phenomenon often ignored by the critics of immigration is that, while immigrants may take jobs from natives in some areas, in others they raise labor productivity and create jobs for natives. High-skilled immigrants are, after all, a self-selected pool of individuals, who move to countries where there is demand for their skills and, in doing so, they raise global productivity.

Skilled foreign-born workers also contribute to the global technological leadership of the United States.[24] According to data collected by the National Academy of Sciences, since 1990 more than half the US Nobel laureates in the sciences were foreign born and about 37 percent received their education abroad. Stephan and Levin measure what they call the "exceptional" contributors among foreign-born scientists using six criteria: individuals elected to the National Academy of Sciences; members of the National Academy of Engineering; authors of highly cited patents; authors of citation classics; authors of ground-breaking papers; and the 250 most cited authors and scientists who have played key roles in starting biotech companies. The authors conclude that the foreign born have contributed disproportionately to US science by all six measures.[25]

An indicator of the contribution of high-skilled foreign-born professionals is the

number of patents they have developed. According to a study by Chellaraj et al., a 10 percent increase nationwide in the number of international graduate students raises university patent grants by 6 percent and non-university patent grants by 4 percent. Using data on patents awarded to different institutions and universities from the National Science Foundation's *Science and Engineering Statistics*, the researchers contend that tight enforcement of restrictions on student visas has the potential to reduce innovative activity.[26]

In recent years, skilled professionals have been at the forefront of creating new businesses in sunrise industries, creating jobs for thousands of natives and foreigners. In California's Silicon Valley, roughly 29 percent of the technology firms started between 1995 and 1998 were run by Chinese or Indians, accounting for $19.5 billion in sales and 72,839 jobs.[27]

Economic Performance of Immigrants

The economic performance of high-skilled immigrants in the United States is not very different from the performance of those US-born with similar characteristics.[28] Borjas finds that immigrants who enter the country with sizable human capital find it easier to adapt and acquire additional skills in their new surroundings.[29] After adjusting for differences due to age and education, high-skilled immigrants have slightly lower employment rates and earnings than natives, but both employment and earnings rise as the length of their stay in the United States increases (Table 6). During 1999-2002, the high-skilled foreign born aged 25 to 54 had an employment rate (employment to population ratio) of 91 percent as compared 94 percent for the US-born after adjusting for age and education. Although the rate of immigrant employment rose with the length of stay in the United

Table 6. Employment and Real Wage of Men Aged 25 to 54 with a BA or Higher Degree, by Nativity and Duration of Stay in the United States

Economic Indicators	Foreign Born by Years in the United States			All Foreign Born	US Born
	<5 years	5-10 years	≥10 years		
Employment rate (employment/population ratio expressed in %)	89	90	91	91	94
Average real hourly wage (expressed in 2002 US Dollars)	24	25	27	26	27

Note: Figures are averaged for 1999-2002, based on the Current Population Survey Monthly Outgoing Rotation Files. The figures are adjusted for age and education. Figures for all foreign born are also adjusted for years lived in the United States.
Source: Current Population Survey for Monthly Outgoing Rotation Files, 1999-2002.

States, it remained lower than native employment rate even for those who had lived in the United States for more than ten years.

Policy Challenges

As the 21st century opens, the US economy faces a conflicting set of objectives in immigration policy. On the one hand, policymakers are concerned about making immigration serve US security interests, leading to more rigorous screening and, in effect, to more restrictive immigration policies. On the other hand, the dependence of several industries on high-skilled foreign talent makes it important to adopt policies that will not jeopardize future flows. Immigration policy affecting the high skilled becomes more crucial as international demand for high-skilled workers increases and other countries pursue aggressive policies to attract skilled immigrants. In 1989, American universities awarded twice the number of PhDs as those granted by major Asian countries; 12 years later, the gap had become almost nonexistent.[30] The European Union granted 22 percent more PhDs than American universities in 1989 and 51 percent more PhDs than American universities in 2001. These global trends portend an eventual erosion of US dominance in higher education, greater competition for the most talented students, and, by extension, a shrinking pool of highly skilled workers available for US jobs. Current debates over comprehensive immigration reform indicate that legislators are increasingly becoming aware of these changing global realities.

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ENDNOTES

1 During 1990-2003, the US economy absorbed close to 700,000 foreign-born persons into the labor force every year. Available online at: http://www.census.gov/population/www/socdemo/foreign/ppl-174.html.

2 See Frank Bean and Gillian Stevens, *America's Newcomers and the Dynamics of Diversity* (New York: Russell Sage Foundation, 2005).

3 Authors' computations based on Census 2000.

4 National Research Council, 2005; Richard B. Freeman, "Does Globalization of the Scientific/Engineering Workforce Threaten US Economic Leadership?" NBER Working Paper 11457. Cambridge, MA: National Bureau of Economic Research, 2005; and Lawrence Summers, Letter to US Secretary of State Colin Powell, 2004. Available online at: http://www.president.harvard.edu/speeches/2004/powell.html.

5 Skill levels of immigrants started rising before 1990, and part of the increase is perhaps due to the general global increase in education levels. See http://www.census.gov/population/www/socdemo/foreign/ppl-176.html.

6 Robert Paral and Benjamin Johnson, "Maintaining a Competitive Edge: The Role of the Foreign-born and US Immigration Policies in Science and Engineering" (Washington, DC: American Immigration Law Foundation Immigration Policy Center, 2004).

7 Freeman 2005 (see n. 4).

8 Researchers often define the highly skilled as persons with at least a university education (NRC 2005, see n 4).

9 See Frank D. Bean and Susan K. Brown, "A Canary in the Mineshaft? International Graduate Enrollments in Science and Engineering in the United States" (Department of Sociology and Center for Research on Immigration. Population and Public Policy, University of California Irvine, 2005).

10 Jeanne Batalova, "The Growing Connection between Temporary and Permanent Immigration Systems" (Washington, D.C. Migration Policy Institute, Independent Task Force on Immigration and America's Future, *MPI Insight* No. 14, 2006).

11 Paral and Johnson, 2004 (see n. 6).

12 South Asia, in this categorization, includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka.

13 Health support workers include nursing aids, dental assistants, medical assistants, physical therapist assistants, and other healthcare support occupations. This category is not composed of health specialists, who include registered nurses, physical therapists, opticians, podiatrists, emergency medical technicians, and other healthcare practitioners.

14 Neeraj Kaushal and Robert Kaestner, "Geographic Dispersion and Internal Migration of Immigrants" (Columbia University Working Paper, 2006).

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16 Joseph G. Altonji and David Card, "The Effects of Immigration on the Labor Market Outcomes of Less-Skilled Natives," in *Immigration, Trade and Labor*, edited by J. M. Abowd and R. B. Freeman (Chicago, IL: University of Chicago Press, 1991); David Card "The Impact of the Mariel Boatlift on the Miami Labor Market," *Industrial Labor Relations Review* 43, no. 2 (1990), 255; and David Card, "Immigrant Inflows, Native Outflows, and the Local Market Impacts of Higher Immigration," *Journal of Labor Economics* 19, no. 1 (2001), 22-64.

17 George Borjas, Richard B. Freeman, and Lawrence F. Katz, "How Much Do Immigration and Trade Affect Labor Market Outcomes?" Brookings Papers on Economic Activity. Washington, DC: The Brookings Institution, 1997, 1-67; G. Borjas, "The Economics of Immigration," *Journal of Economic Literature* (December 1994), 1667-1717; and G. Borjas, "The Labor Demand Curve *Is* Downward Sloping: Re-examining the Impact of Immigration on the Labor Market," *The Quarterly Journal of Economics* 118 (2003), 1335-1374.

18 George Borjas, "The Labor Market Impact of High-Skill Immigration." NBER Working Paper 11217. Cambridge, MA: National Bureau of Economic Research, 2005.

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20 Madeline Zavodny, "The H-1B Program and Its Effects on Information Technology Workers," *Economic Review* (Third Quarter) (Atlanta, GA: Federal Reserve Bank of Atlanta, 2003).

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22 Richard Freeman, B. E. Jin, and C. Y. Shen, "Where Do New US-Trained Science-Engineering PhDs Come from?" NBER Working Paper 11457 (Cambridge, MA: National Bureau of Economic Research, 2004).

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24 Summers, 2004 (see n. 4).

25 Paula Stephan and Sharon Levin, "Foreign Scholars in US Science: Contributions and Costs," *Science and the University*, eds. Ronald Ehrenberg and Paula Stephan (Madison, WI: University of Wisconsin Press, forthcoming).

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27 AnnaLee Saxenian, "Silicon Valley's New Immigrant High-Growth Entrepreneurs," *Economic Development Quarterly* 16, no. 1 (2002).

28 An indicator of the relative performance of foreign-born skilled workers is that they are as likely to be hired by multinational corporations as are the US-born with comparable skills. According to a National Academy of Sciences report, the proportion of international researchers in several large multinational corporations is around 30 to 50 percent (see n. 4).

29 George Borjas, "The Economic Progress of Immigrants," NBER Working Paper 6506. Cambridge, MA: National Bureau of Economic Research (1998). Regets and Duleep (2002), on the other hand, find the existence of an inverse relationship between initial immigrant earnings and subsequent earnings growth. Harriet Orcutt Duleep and Mark C. Regets, "The Elusive Concept of Immigrant Quality: Evidence for 1970-1990," IZA Discussion Papers 631, The Institute for the Study of Labor (IZA)(2002).

30 Freeman 2005 (see n. 4).

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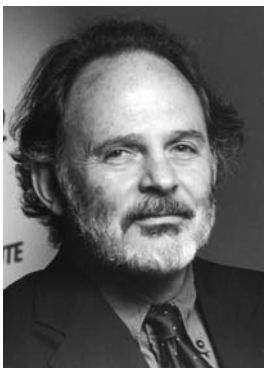

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