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College-Educated Immigrants Bolster U.S. Productivity

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The United States is the largest destination in the world for college-educated immigrants, but their path to employment in this country has become increasingly difficult during the past decade, a condition that can hinder productivity growth. This brief discusses the main contributions that college-educated immigrants make to U.S. productivity growth, such as providing scarce skills that supplement and complement those of native workers, contributing disproportionately to innovation and promoting job creation in the United States by foreign-based multinational corporations.

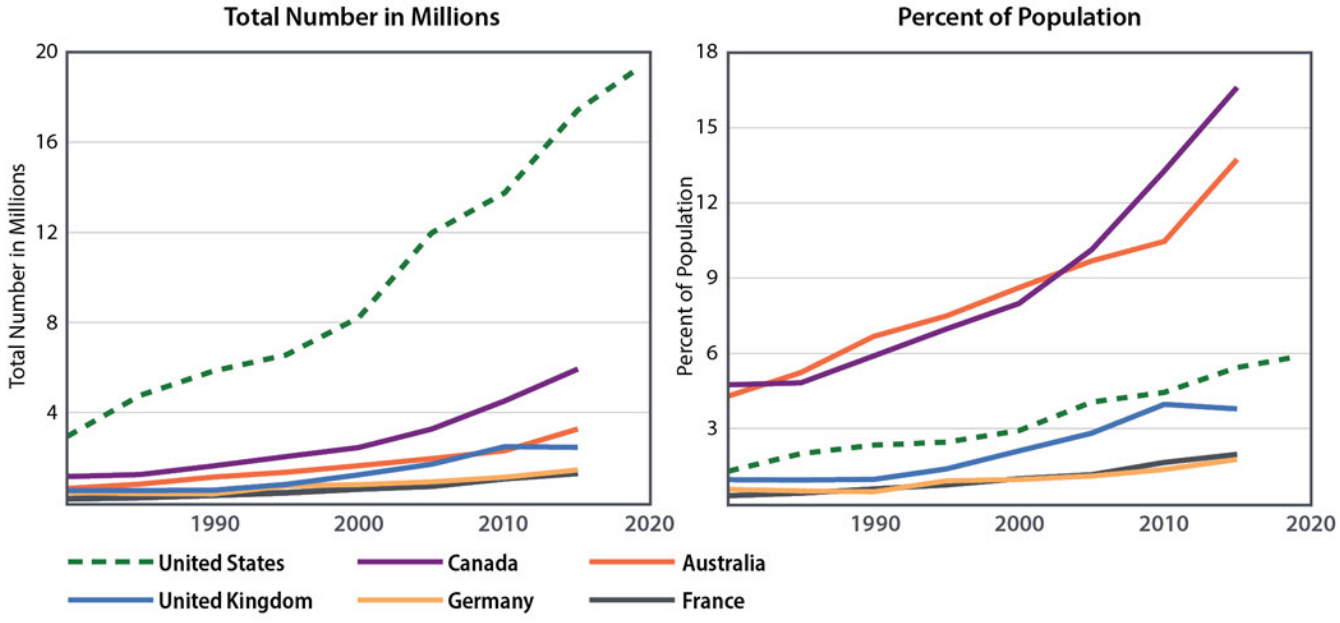
Attracting talented foreign workers bolsters the domestic economy because immigrants bring new skills, information and knowledge that improve productivity. This brief focuses on immigration of college-educated workers to the United States during the past 20 years.

Looking at college-educated workers separately is important because the path for immigration tends to be very different for workers with college degrees, particularly in the United States. Immigrants with college degrees come to the United States predominantly through the H-1B program or other employment-based visa programs, while those without college degrees come to the country predominantly through the family reunification path. In the H-1B program, employers select and sponsor immigrants to work in the United States for three years, with the option to renew for three additional years. Once the H-1B visa expires, employers can help those immigrants obtain green cards that allow them to continue working in the United States. But the number of employment-based visas awarded each year is capped, and when the number of applicants exceeds the cap, the United States allocates the visas through a lottery among all applicants. Both the visa cap and the lottery system have generated intense policy discussions in recent years.

The left panel of Figure 1 shows that the United States is the main destination in the world for immigrants with at least one year of college education. The total number was larger than the next five nations combined in 2015, and immigrants with some college education

represented 45 percent of all immigrants in the United States by 2019. However, when looking at the numbers relative to total population, the story is substantially different.

Figure 1: College-Educated Immigrants in Their Top Six Destination Countries



Sources: Institute for Employment Research (IAB) brain-drain database (1980-2010). OECD Database on Immigrants in OECD Countries (2015). American Community Survey (2019). Total population by country comes from the World Bank.

Notes: College-educated immigrants are defined as workers born outside the United States who have at least one year of college education.

Enlarge

The right panel of Figure 1 shows that immigrants with college educations accounted for more than 13 percent of Australia's population and more than 16 percent of Canada's population in 2015. Both countries' immigration polices heavily favor skilled workers. The United States ranks closer to the United Kingdom, with college-educated immigrants comprising slightly more than 5 percent of the population in 2015.

Countries such as Australia and Canada seem to place higher value on the economic contributions of college-educated immigrants. These contributions fall into three main categories. One, immigrants increase productivity by bringing scarce skills that supplement and complement the skills of native workers. Two, immigrants contribute disproportionately to innovation. And three, foreign firms who want to invest in the United States benefit from home-country immigrants who can reduce communication and cultural barriers. Economic research overwhelmingly concludes that these benefits exceed any costs imposed on native workers and that the United States could benefit from reforming the process for granting work visas.

Table 1: Top Jobs for College-Graduate Immigrants

Occupation	Percent Shares 2000	2019
Managers	16.5	16.5
Computer Scientists	10.5	13.4
Registered Nurses	3.6	4.5
Engineers	5.6	4.2
HS/College Subject Instructors	3.4	3.7
Teachers	2.7	3.4
Accountants and Auditors	3.6	2.7
Physicians	3.9	2.5
Other Financial Specialists	1.2	1.4
Management Analysts	1.0	1.3
Other Occupations	48.0	46.3
College-Grad Immigrants per 10 College-Grad Natives		
Occupation	**2000**	**2019**
Computer Scientists	2.7	4.2
HS/College Subject Instructors	1.7	2.9
Physicians	2.6	2.5
Engineers	2.3	2.5
Management Analysts	1.0	1.7
Accountants and Auditors	1.2	1.6
Registered Nurses	1.3	1.6
Managers	1.1	1.4
Other Financial Specialists	1.1	1.2
Teachers	0.3	0.7
Other Occupations Combined	1.1	1.4

Source: American Community Survey

Notes: The sample is restricted to employed college graduates. It includes only immigrants who immigrated to the United States after age 18.

Enlarge

Bringing Scarce Skills that Complement the Skills of Native Workers

As a first step toward understanding how immigrants integrate into the U.S. labor market, we can look at the types of jobs they fill. The top half of Table 1 shows that during the past 20 years, immigrants have become more concentrated in computer science, nursing and teaching. Immigrants with college degrees are more overrepresented in computer science than in any other occupation: For every 10 U.S.-born computer scientists, there are 4.2 foreign-born computer scientists. (See the bottom half of Table 1.) Similar patterns emerge at the industry level (not shown in the table). For every 10 native workers, there are 4.8 and

3.8 immigrants in electrical equipment manufacturing and computer/data processing, respectively. The education industry also employs disproportionately more immigrants, a percentage that has grown substantially in the past 20 years.

Immigrants' occupational choices are important to understanding their impact on U.S. productivity. In research published in 2009 and 2011, Giovanni Peri of UCDavis and Chad Sparber of Colgate University evaluated whether immigrants perform significantly different tasks than natives.[1]

In the case of college-educated workers, they found that immigrants tend to specialize in occupations that require quantitative and analytical skills, such as computer programming and math, while natives tend to specialize in communication and other interactive occupations, such as management. When there is an increase of college-educated immigrants working in a given occupation, native U.S. workers in that occupation become more likely to move to occupations that require higher-level communication skills. These findings suggest that immigrants and natives have skills that are complementary and that the presence of immigrants can promote better specialization across occupations.

Contributing Disproportionately to Innovation

Since employers select the college-educated immigrants that come into the country, and the supply of immigrants is restricted, those who get the opportunity to immigrate tend to be more highly skilled than the average college graduate in the United States. Workers with such specialized skills can help develop new technologies and production processes by engaging in innovation.

A seminal 2010 paper on the relationship between immigration and innovation — written by Jennifer Hunt of McGill University (at the time) and Marjolaine Gauthier-Loiselle of Princeton University (at the time) — showed that at the state level, a 1 percent increase in college-graduate immigrants increases patents per capita by 9 percent to 18 percent.[2] The patenting prowess of college-graduate immigrants can be explained almost entirely by immigrants disproportionately holding degrees in science and engineering. Such findings are consistent with the data in Table 1, which show that immigrants disproportionately work as computer scientists, engineers and college professors in high-innovation industries such as information technology, electrical manufacturing and higher education.

More recently, economists at Stanford University exploited a novel dataset that links individuals to patent records to quantify the contributions of immigrants to innovation in the United States.[3] (Like Hunt and Gauthier-Loiselle, they used patents as a proxy for innovation.) First, they showed that while immigrants are only 10 percent of the U.S. population, they account for 16 percent of all inventors (defined as originators of patented innovations) and 23 percent of all patents. The researchers also note that immigrants and natives obtain patents of similar quality. They find further evidence that immigrants are

more likely to cite patents by foreign inventors and to coauthor with inventors who reside outside the United States. They conclude that the ability of immigrants to bring in foreign technologies and collaborate with a more diverse group of researchers might be why immigrants are able to obtain more patents.

To estimate the total contribution of immigrants to U.S. innovation, the Stanford economists quantify not only the direct effects, through the creation of patents by immigrants, but also the indirect effects, such as positive productivity spillovers on U.S. inventors. For example, immigrants could expose natives to new sets of tools and technologies. The researchers find that, on average, terminating a research relationship with an immigrant collaborator decreases the U.S. inventor's future patenting activity by 26 percent, while terminating a research relationship with a U.S. collaborator decreases future patenting by 10 percent. Using these results, they estimate that immigrants contribute 37 percent of total U.S. innovation, 15 percent directly and 22 percent indirectly.

Reducing Communication and Cultural Barriers

Historically, policymakers have attempted to create jobs in their countries by designing policies to attract economically significant operations of foreign-based multinational corporations. Immigration can have a big impact on such location decisions because immigrants have skills, such as knowledge of a foreign language or foreign cultural norms, that facilitate communication between the parent company and the U.S. affiliate. Konrad B. Burchardi at Stockholm University, Thomas Chaney of Science Po and Tarek A. Hassan at Boston University established this relationship in a 2019 paper using 130 years of data on immigration to U.S. labor markets.[4] They found that within a labor market, the number of U.S. jobs available at firms headquartered in a specific origin country increases 7 percent when the number of individuals with ancestry from that country doubles. The main explanation for this effect is that immigrants facilitate communication between the affiliates in the United States and their parent companies abroad. The researchers concluded that the effects of immigration on foreign direct investment last a long time — even after immigration from a specific country to the labor market ceases — because immigrants pass traits to their descendants, such as language skills and cultural norms, that help reduce communication barriers.

My research also has provided consistent evidence that foreign multinationals in the United States highly value immigration from their home countries.[5] Using a novel dataset of H-1B visas, I found that foreign companies in the United States hire immigrants from their home countries at higher rates than domestic firms. The companies with the highest concentrations of own-country immigrants tend to be headquartered in countries that are farther away from the United States and whose main language is not English. These patterns are consistent with immigrants being more valuable for being able to reduce communication and cultural barriers.

Implications for Policy Discussions

Opponents of expanding immigration tend to argue that immigrants compete with natives who perform similar tasks, thereby reducing employment opportunities and wages for natives. However, empirical studies tend to find either negligible negative effects or positive effects on native wages and employment.[6] In the case of college-educated immigration, these results can be explained by the types of immigrant contributions highlighted in this brief. First, highly skilled immigrants quite often fill jobs in growing sectors, such as information technology and health care, by providing scarce skills that supplement and complement those of native workers. Second, college-educated immigrants contribute disproportionately to innovation, which helps American companies develop new products and expand production. And third, highly skilled immigrants facilitate U.S. expansions of multinational corporations that create jobs for both immigrants and natives.

If the effects of college-educated immigration are overwhelmingly positive, the policy discussion naturally shifts to finding ways to increase the inflow of top foreign talent. In a 2020 working paper, Harvard Business School professor William R. Kerr identifies two main gatekeepers of college-educated immigrants: businesses and universities.[7]

Businesses help immigrants enter the country through the H-1B program and other employment-based visa programs, but the United States caps the total number of H-1B visas available annually for a majority of industries.[8] This cap has not increased since 2004, but every year since 2014, the total number of applications has risen to double or, in some years, triple the number of available slots. This pattern implies that prospective immigrants face increasing uncertainty over whether they will "win the lottery" and gain access to U.S. labor markets. Such uncertainty might discourage some of the most talented workers from even attempting to immigrate to the United States.

Universities try to select the most promising foreign-born students for both undergraduate and graduate programs, and many of those students want to work in the United States after completing their degrees. However, foreign graduates from U.S. institutions still need to get an employment-based visa, such as an H-1B, if they intend to remain in the United States. Hence, students could be discouraged from applying to study in the United States by the higher uncertainty of receiving an employment visa after graduation.

Reforms designed to improve the H-1B allocation process, increase the H-1B cap and simplify the transition of immigrant students from universities to the labor market could have a significantly positive impact on U.S. productivity.

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[1] *See Giovanni Peri and Chad Sparber, "Task Specialization, Immigration, and Wages," American Economic Journal: Applied Economics, July 2009, vol. 1, no. 3, pp. 135–169; also, see Peri and Sparber, "Highly-Educated Immigrants and Native Occupational Choice," Industrial Relations: A Journal of Economy and Society, July 2011, vol. 50, no. 3, pp. 385–411.*

[2] *Jennifer Hunt and Marjolaine Gauthier-Loiselle, "How Much Does Immigration Boost Innovation?" American Economic Journal: Macroeconomics, April 2010, vol. 2, no. 2, pp. 31–56.*

[3] *Shai Bernstein, Rebecca Diamond, Timothy McQuade and Beatriz Pousada, "The Contribution of High-Skilled Immigrants to Innovation in the United States," Manuscript, July 2019.*

[4] *Konrad B. Burchardi, Thomas Chaney and Tarek A. Hassan, "Migrants, Ancestors and Foreign Investments," Review of Economic Studies, July 2019, vol. 86, no. 4, pp. 1448–1486.*

[5] *Nicolas Morales, "High-Skill Migration, Multinational Companies, and the Location of Economic Activity," Federal Reserve Bank of Richmond Working Paper No. 19-20, December 2019.*

[6] *See William R. Kerr and William F. Lincoln, "The Supply Side of Innovation: H-1B Visa Reforms and U.S. Ethnic Invention," Journal of Labor Economics, July 2010, vol. 28, no. 3, pp. 473–508; also, see Giovanni Peri, Kevin Shih and Chad Sparber, "STEM Workers, H-1B Visas, and Productivity in U.S. Cities," Journal of Labor Economics, July 2015, vol. 33, no. S1, part 2, pp. S225–S255.*

[7] *William R. Kerr, "Global Talent and U.S. Immigration Policy," Harvard Business School Working Paper No. 20-107, April 2020.*

[8] *Many nonprofit employers, such as government agencies and most colleges and universities, are exempt from the cap.*

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