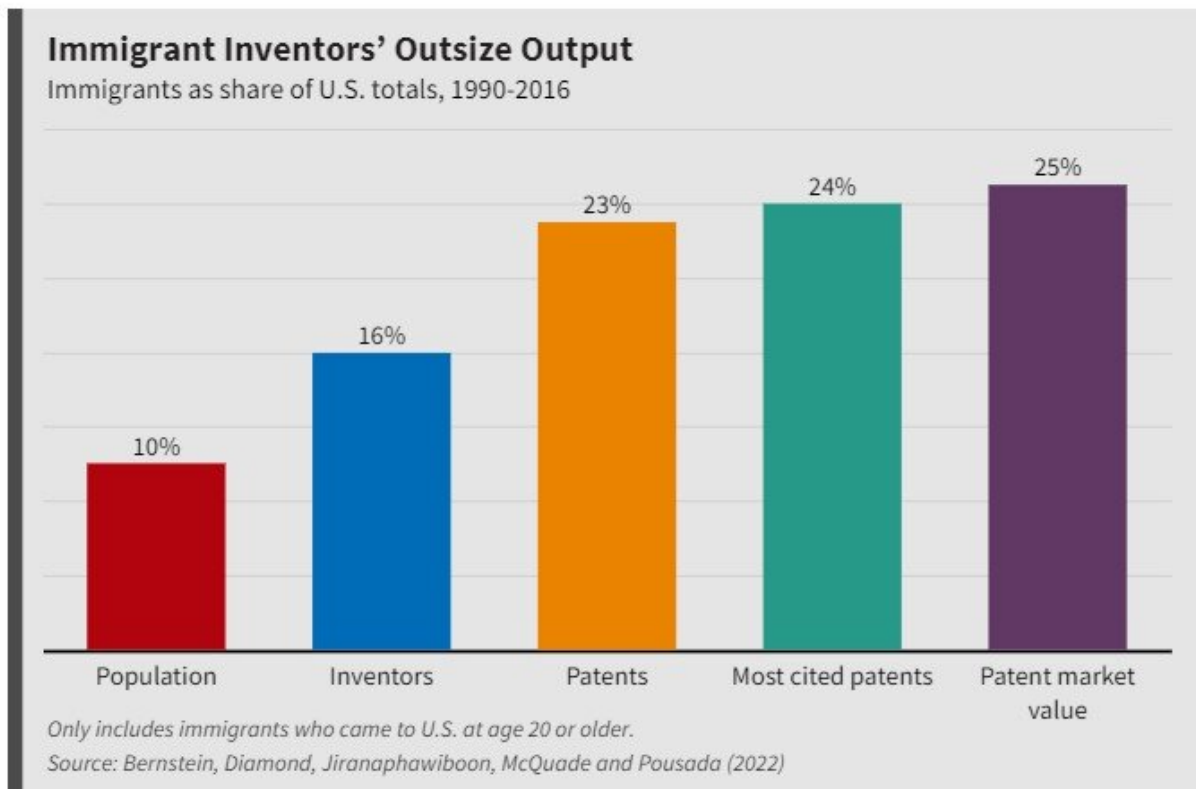


# A new look at immigrants' outsized contribution to innovation in the US

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Credit: Stanford University

The United States has long touted itself as a nation built by immigrants. Yet there has never been a precise measure of immigrants' contribution to the country's economic and technological progress. Around the time

that President Donald Trump was moving to curb employment visas for skilled foreigners, economist Rebecca Diamond and a team of researchers set out to examine this unresolved question.

To find the answer, the researchers looked at the output of nearly 880,000 Americans who patented inventions between 1990 and 2016. They found that immigrants made an outsize contribution to innovation in the U.S. While they constituted 16% of [inventors](#), immigrants were behind 23% of the patents issued over these years.

It wasn't just a matter of quantity: The share of patents immigrants produced was slightly higher when weighted by the number of citations each patent received over the next three years, a key measure of their quality and utility. Moreover, immigrants were responsible for a quarter of the total economic value of patents granted in that period, as measured by the stock market's reaction to new patents.

"The high-skilled immigrants we have in the U.S. are incredibly productive and innovative, and they're disproportionately contributing to innovation in our society," says Diamond, a professor of economics at Stanford Graduate School of Business.

Past research has indirectly pointed to the sizable role immigrants play in American innovation. Studies have shown that immigrants represent nearly a quarter of the U.S. workforce in science, technology, engineering, and mathematics and more than a quarter of the nation's Nobel Prize winners. But this study, described in a recent working paper, is the first time economists have used patents to directly measure the output of foreign-born innovators living in the U.S. The data was clear: "The average immigrant is substantially more productive than the average U.S.-born [inventor](#)," write Diamond and her colleagues, Abhisit Jiranaphawiboon, a Ph.D. student at Stanford GSB; Beatriz Pousada, a Ph.D. student at Stanford; Shai Bernstein of Harvard Business School;

and Timothy McQuade of UC Berkeley's Haas School of Business.

The researchers took a unique approach to their work. They started with a database of 300 million adults who had lived in the country between 1990 and 2016 and then used Social Security numbers to identify those who had immigrated after age 19. (The first five digits of a Social Security number encode the date it was issued; U.S.-born citizens typically receive their numbers at birth or in childhood.) Using names and address history, they matched individuals in the database to those listed as inventors with the United States Patent and Trademark Office. (When patents had multiple authors, each got credit for a proportional share.)

The researchers found that immigrants generate patents across a broad swath of sectors, including computers, electronics, chemicals, and medicine. They also discovered that, while all inventors reach peak productivity in their late 30s and early 40s, immigrants decline from that peak at a slower rate than U.S.-born inventors over the rest of their careers, a disparity that remains unexplained.

## **The immigrant innovation gap**

Diamond believes there are several potential reasons for the innovation gap between immigrant and native-born inventors. One is [brain drain](#): "There's likely a pretty strong positive selection in terms of the types of people from every country that end up as high-skilled professionals with U.S. visas," she says.

Another factor is cross-border collaboration: The researchers observed that foreign-born inventors are more likely to work with inventors based in other countries and cite foreign technologies in their patents. "Different pools of knowledge get imported by immigration, and diversity in background is good for innovation," Diamond says.

Diamond and her team also found evidence that immigrant inventors are more likely to live in innovation hubs, such as Silicon Valley or Boston, and to work on patents in cutting-edge technology sectors. Still, the researchers estimate that these two factors explain just 30% of the gap in patent output.

Immigrant inventors' contributions go beyond their own work—they also make their native-born collaborators more productive, the researchers discovered. To arrive at this finding, Diamond and her team identified inventors who died before they turned 60 and examined the output of people who had co-authored a [patent](#) with that individual before their early death. Compared to a control group of inventors that did not lose a collaborator, surviving inventors produced 10% fewer patents after the death of their co-author. The effect was larger for inventors whose deceased co-author was an immigrant—their productivity declined by 17%. This gap persisted even after the researchers controlled for a number of factors, such as the productivity of the deceased inventors.

"At the end of the day, we weren't really able to explain the gap," Diamond says. "It seems there's something special about being an immigrant. Their knowledge has these huge external effects on who they work with, and what they know impacts what their collaborators can produce in the future."

Diamond believes these findings have direct implications for policymakers who want to maintain the nation's role as a technological trailblazer. "Understanding the forces that make the U.S. one of the most innovative and productive countries in the world is important," she says. "The U.S. has done an amazing job of attracting the best and the brightest immigrants. Any policy that would revamp the visa process might want to consider how big a deal [immigrants](#) are in our innovation output."

**More information:** The Contribution of High-Skilled Immigrants to Innovation in the United States: [www.gsb.stanford.edu/faculty-research/innovation-united-states](http://www.gsb.stanford.edu/faculty-research/innovation-united-states)

Provided by Stanford University

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