

## Uneven Innovation in the U.S.

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Innovation is a key driver of economic growth and development, but it is unevenly distributed across the United States. In this essay, I examine the pattern of innovation across urban areas in the U.S., its path of concentration over time, and its implications for income inequality.

Figure 1 illustrates the extent to which innovation is concentrated in the U.S. using data on patent filings mapped to inventor locations. The top 10 urban areas in the U.S. account for approximately 48% of all patents filed in the country between 1990 and 2015. The most innovative regions by patent filings are the San Jose and San Francisco core-based statistical areas (CBSAs)—aka Silicon Valley. This area alone accounts for nearly 20% of all patents filed during this period. The New York CBSA follows it with about 7% of overall patents filed.

The concentration of innovation in the U.S. is even more surprising when we consider the geographic concentration of its workforce. Figure 2 shows the top 10 urban areas, which account for about 27% of the overall U.S. workforce and about 33% of the college-educated workforce. The San Jose and San Francisco CBSAs really stand out when comparing Figure 1 with Figure 2: Neither area

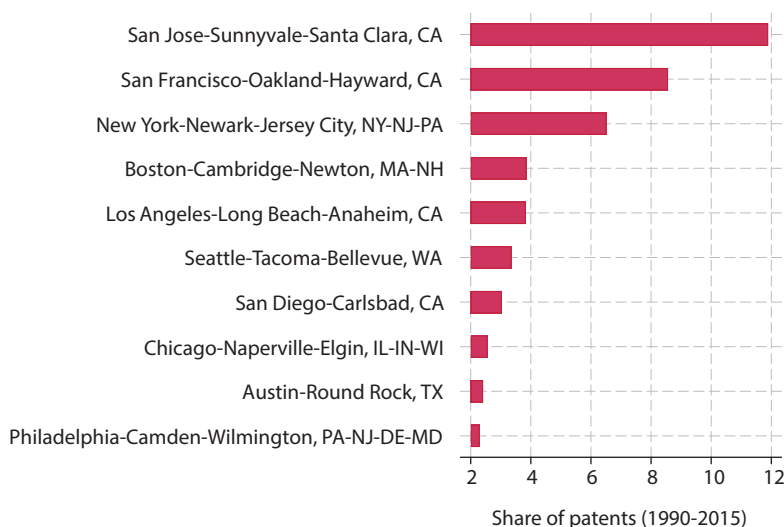
is in the top 10 by population, individually containing merely 1% of the U.S. workforce, but jointly they produce about 20% of all innovation output.

These concentration patterns are even more striking for patents that contain certain prominent “disruptive” technologies; that is, technologies that appear frequently in earnings conference calls, which indicates their importance. I identify disruptive patents by looking for key words and phrases associated with disruptive technologies, such as “smartphones,” “hydraulic fracturing,” and “cloud computing.” [This paper](#) lists disruptive technologies.

The San Jose CBSA leads the pack again, accounting for over 14% of all disruptive patents filed during 1990-2015. The San Francisco CBSA follows closely, contributing around 10% of disruptive patents. Together, these two urban areas play a significant role in driving prominent innovations.

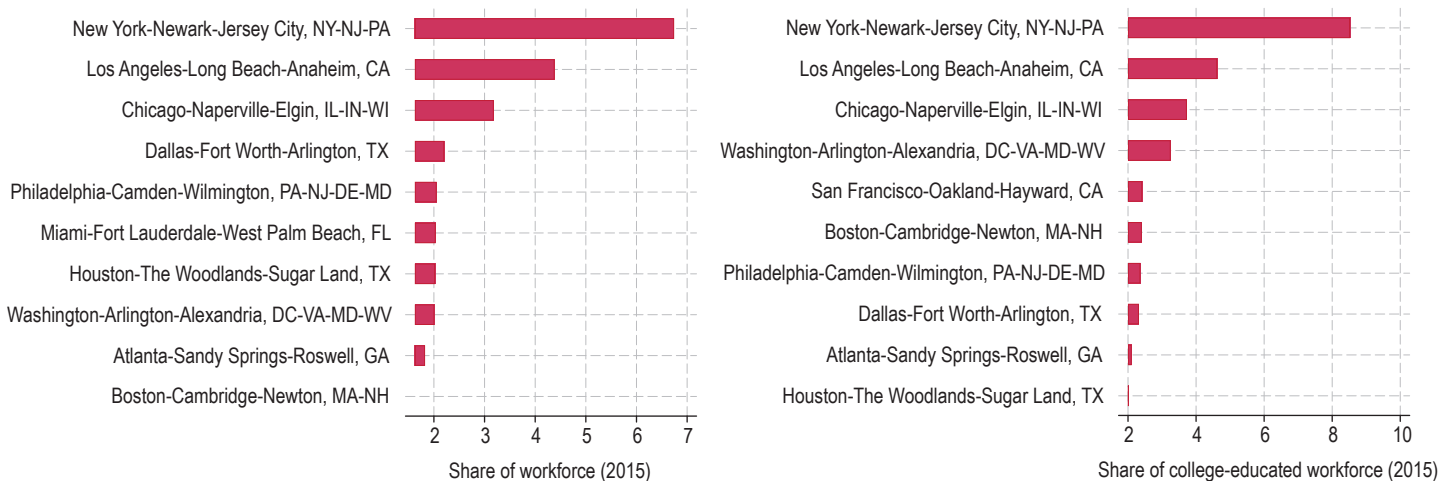
Over the past three decades, innovation in the U.S. has become more concentrated. Figure 3 illustrates the percentage of patents in the top 10 urban areas for each year between 1990 and 2015. In the 1990s, these areas accounted for about 52% of patents, but more recently they’ve

Figure 1  
**Concentration of Patent Filings by Urban Area (1990-2015)**



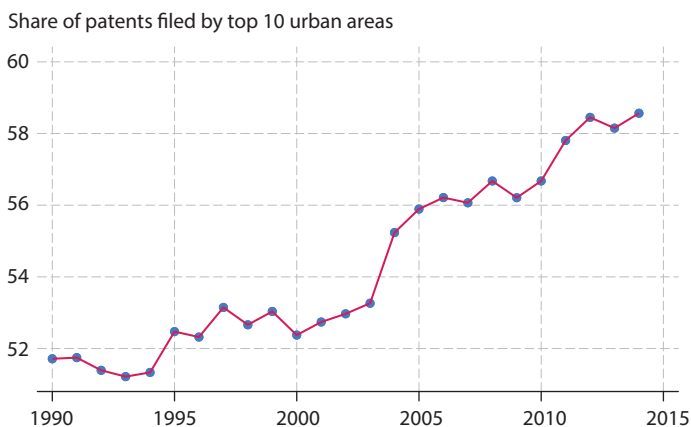
SOURCE: United States Patent and Trademark Office (USPTO) and author's calculations.

Figure 2  
**Shares of U.S. Workforce and College-Educated Workforce by Urban Area (2015)**



SOURCE: American Communities Survey (2015) and author's calculations.

Figure 3  
**Share of Patents Filed by Top 10 Urban Areas**



SOURCE: United States Patent and Trademark Office (USPTO) and author's calculations.

accounted for about 58%. The increase in patents filed by inventors in Silicon Valley has driven this rise. In 1990, the New York CBSA led the nation in patent filings, slightly ahead of the combined share of two key areas in Silicon Valley. However, by 2015, Silicon Valley's share of patent filings had grown substantially to more than twice New York's share.

On the one hand, the concentration of innovation can have desirable effects, such as generating knowledge spillovers. For example, inventors and firms working in biotechnology benefit from co-location spillovers near Boston and from locations near universities, which train and develop this specialized workforce. By clustering together, these inventors, firms, and universities can share ideas, collaborate on projects, and tap into a pool of specialized talent and resources.

On the other hand, the concentration of innovation could foster unequal economic outcomes across regions and communities in the U.S. The top 10 innovative urban areas (Figure 1) have experienced some of the largest wage increases. Between 1990 and 2015, the average nominal income in these regions increased by 36%, while the average income in the U.S. increased by 25%. Higher incomes for college-educated workers primarily drove these differences. Incomes for workers without a college degree in the top 10 innovative regions increased by 20%, compared with 17% in other regions.

In summary, a large chunk of innovation in the U.S. is concentrated in a few urban areas, and this concentration is increasing. While this is likely beneficial for individuals and firms in these areas, it might also exacerbate regional inequality. ■