

When they leave declining firms, highly skilled, high-tech workers are also more likely to leave struggling American regions



Given the increasing trend towards knowledge-based economies, it is important for policymakers to understand how the emergence of new technologies can impact job creation and worker displacement. [Melissa Haller](#) examines data on inventors from 110 firms from the United States Patent and Trademark Office to analyze the relationship between firm closures and patenting workers and finds that while more productive and well-connected inventors have an easier time finding patenting re-employment, they are also more likely to move, contributing to a local brain drain.

In recent decades, the United States, Europe, and other advanced economies have transitioned to knowledge-based economies, an economic system based around knowledge-intensive, high-tech industries. A key feature of the knowledge economy is its tendency towards creative destruction: when a new technology emerges, it often displaces existing ones and the industries that came before it. Both firm creation and firm decline are a common occurrence in the knowledge economy. While extensive research has focused on how regions can attract and grow thriving high tech sectors, less attention has been paid to the potential harmful effects that may arise from this economic model. When a major firm or plant cannot compete and shuts down, job loss is just one of many challenges a city or region will face: a local brain drain may also be a pressing issue for struggling regions.

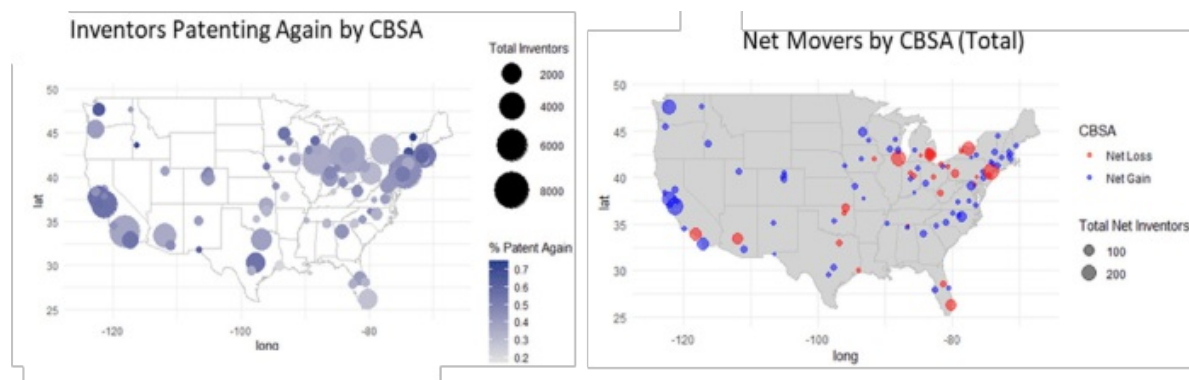
How firm shutdowns impact inventors

To investigate how the decline of a major firm impacts patenting workers, I used United States Patent and Trademark Office ([USPTO](#)) data from 1976 to 2015. Patent data contains detailed information about the organizations and inventors that patent, and enables me to trace inventors across firms and regions as they produce new patents. My final dataset contains information on the inventors from 110 United States firms that have either closed, declared bankruptcy, merged with another firm, or been acquired by another firm, and includes well-known corporations like Eastman Kodak, General Motors, and Motorola. It's important to note that while mergers and acquisitions are not always considered "decline" in a traditional sense, these events still represent a significant disruption to a workforce. For example, [evidence suggests](#) that, on average, roughly 30 percent of the existing workforce is typically deemed redundant because of a merger or acquisition event.

I chose to focus on displaced inventors (including those laid off from, or who have voluntarily left a declining firm) for a few reasons: first, inventors are the scientists, engineers, and researchers that produce new innovations and technologies within firms and other organizations. As more workers pursue STEM degrees or work in technical occupations than ever before, this research is relevant to a growing proportion of the global workforce. Second, as the production of new technologies becomes increasingly tied to regional economic prosperity, the mobility of displaced inventors is an important consideration for regional policy makers.

Figure 1 shows the geographic distribution of inventors in my sample across US regions or Core-Based Statistical Areas (CBSAs). As the first panel shows, the inventors are primarily concentrated in major cities in the Northeast, Midwest, and Southwest United States. However, whether inventors successfully find new patenting jobs after being displaced varies by region: while as many as 70 percent of inventors in some regions find patenting re-employment, in other regions as few as 20 percent of inventors ever patent again. Inventors who do not find re-employment in a patenting role may retire or switch into non-patenting occupations. Many inventors move to new cities or regions after being displaced from a declining firm; as the second panel shows, cities in the Northeast and Midwest regions (often known as the former industrial belt region of the US) appear to exhibit the largest net loss of inventors in the sample.

Figure 1 – Inventors and Inventor Mobility by Core-Based Statistical Area, 1976-2015



Using a regression model, I examine the individual and regional characteristics that influence inventors' employment outcomes. I find that while more productive and well-connected inventors have an easier time finding patenting re-employment, they are also more likely to move to a new city after being displaced by a declining firm. Regionally, inventors are more likely to successfully find patenting re-employment in cities with a high concentration of firms that are technologically diverse; patenting opportunities in technology areas that are both related and unrelated to an inventor's existing skillsets enhances their likelihood of finding re-employment. While cities with related technological variety may have more employment opportunities that are a strong match for an inventor's skills, cities with unrelated technological variety may have strong employment opportunities across many diverse industries.

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Mobility, Displacement and Policy

What do these findings mean for policy makers? First, it shows that some high-tech workers may struggle substantially more than others after displacement. Inventors who are less experienced or productive, those with weaker network connections, and those with more specialized skills may face greater challenges. Further, inventors who are unable or unwilling to move after displacement may have access to fewer employment opportunities, especially in regions with less diversified economies. These workers may require more re-employment assistance than others.

Additionally, my work shows that the most skilled and productive inventors often move after leaving a declining firm. This “brain drain” may deprive regions of valuable skills and human capital. This loss may be particularly devastating in smaller or more specialized US regions, although more work is needed to better understand the complex and uneven impacts of brain drain and worker mobility on regional economies. Programs aimed at retaining skilled workers, or at retraining and upskilling local workers who do not move, may help to offset these losses.

- This article is based on the paper, [‘Firm decline and the mobility of US inventors, 1976–2015’, in *Environment and Planning A: Economy and Space*](#)

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Melissa Haller is a Lecturer and Coordinator for the Digital and Data Studies program at Binghamton University, where she also teaches in the Geography department. Trained as an economic geographer, Melissa is interested in understanding the dynamics of economic change, decline, and resilience. Her recent work has focused on how workers, regions, and innovation more broadly are impacted and disrupted by major firm closures.