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# The Great Recession Drastically Changed the Skills Employers Want

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The employment shift from occupations that require mid-level skills toward those at the high and low ends is one of the most important trends in the U.S. labor market over the past 30 years. Previous research has suggested that a primary driver of this job polarization is something called routine-biased technological change (RBTC), an unfortunate mouthful whereby new technologies substitute for repetitive, middle-skill jobs and complement analytical, high-skill

jobs. Think of word processors replacing typists or engineers using AutoCAD software. Until recently, economists thought of this trend as a gradual phenomenon that didn't depend much on the ups and downs of the economy.

However, studies dating back to Joseph Schumpeter's coinage of the term "creative destruction" suggest that adjustments to technological change may be more episodic. In boom times, companies may face adjustment costs that deter them from adapting to technological change. Recessions, in contrast, can produce large enough shocks to overcome these frictions.

Whether adjustments to new technology are gradual or sudden is important for policy and for our understanding of economic recoveries. The recoveries from the last three U.S. recessions (1991, 2001, 2007-09) have been jobless, meaning that employment was slow to rebound despite recovery in total economic output. If adjustment to new technology is sudden and concentrated in downturns, large numbers of displaced workers may be left with the wrong skills as the economy recovers.

In recent research we investigate how the demand for skills changed over the Great Recession (2007-09). Using nearly all electronically posted job vacancies in 2007 and 2010-2015 collected by the analytics company Burning Glass Technologies, as well as geographic differences in economic conditions, we establish a new fact: the skill requirements of job ads increased in metro areas that suffered larger employment shocks in the Great Recession, relative to the same areas before the shock and to other areas that experienced smaller shocks. Our estimates imply that ads posted in a hard-hit metro area are about 5 percentage points (16%) more likely to contain education and experience requirements and about 2-3 percentage points (8-12%) more likely to include requirements for analytical and computer skills.

Moreover, the vast majority of this "upskilling" persists through the end of our sample in 2015. That is, even while most measures of local labor-market strength had converged back to pre-recession levels, differences in advertised skill demands remain. This holds true even when we statistically control for the availability of skilled labor and the composition of ads across firms and occupations. In fact, we find that the same firms that upskilled by 2010 drive the persistence later in our sample period - the companies that reacted to the recession by looking for more skilled workers were still pursuing that strategy five years later.

These patterns are consistent with a restructuring of labor demand towards these skills. Why might that have happened? Notably, the skill requirements we analyze – education, experience, analytical aptitude, and computer skills – have been found to complement new technologies. (We identify analytical requirements by the presence of keywords like “research,” “decision,” and “solving.”) If a structural shift in line with RBTC is occurring, we would expect changes in these skill requirements also to be accompanied by an accelerated adoption of such technologies. And that’s just what we find. Increases in skill requirements are correlated with capital investments for both metros and individual firms.

Using the Ci Technology Database from Harte-Hanks, a market intelligence firm, we show that businesses in harder-hit metro areas exhibited faster adoption of personal computers at the same time as they upskilled in job postings. These differences emerge only after the Great Recession and, once again, persist through our sample period. We are also able to link firms in our job postings database to those in the Harte-Hanks database, as well as to publicly traded firms in Compustat. We show that the firms with greater increases in capital investments, either PC adoption or physical capital holdings, are also more likely to upskill in their job postings.

Furthermore, if this increased investment and upskilling is related to routine-biased technologies, we would expect to see the strongest changes for the jobs most susceptible to such technologies – routine ones. We distinguish routine-cognitive occupations (e.g., clerical, administrative, and sales) from routine-manual ones (e.g., production and operatives). For routine-manual occupations, we find evidence consistent with firms’ substitution of technology for labor – a sharp increase in layoff risk for workers in harder-hit areas early in the Great Recession, followed by persistently depressed employment level with little impact on skill requirements. This is the traditional view exhibited in studies of job polarization and in the popular press on the fear of automation: employment losses concentrated in occupations we expect to be most readily replaceable by machines.

However, in contrast to this conventional view of labor substitution, in harder hit metro areas, routine-cognitive occupations like clerical and sales surprisingly exhibit only modest increases in layoff risk and no relative employment losses. Instead, we show that these occupations experience pronounced upskilling, as well as modest relative wage and employment growth after the recession. That is, rather than disappearing entirely, surviving routine-cognitive occupations appear to have become both relatively higher-skilled and more productive. These occupations thus became less routine – and more analytical – because of the Great Recession.

In summary, we find that businesses more severely affected by the Great Recession were more likely to invest in new technology, and while this technology may have helped replace some forms of routine jobs, it apparently increased the demand for greater worker skills for other routine jobs.

The U.S. economy has seen remarkable changes over the past 30 years, brought on by the computer revolution and globalization. These changes have led to great increases in productivity and wealth, but the benefits have not been shared across all workers. Many workers, formerly employed in routine jobs, have suffered permanent harm, in terms of their health and economic prospects. Our results highlight that a worker's ability to adjust to these changes may be especially difficult because the changes are sudden, concentrated in recessions. Consequently, in a short time period, large numbers of workers can find their skills depreciated and no longer relevant, with limited prospect of finding comparable reemployment. Public policy has yet to figure out how to reallocate workers on a large scale following a recession, or provide for training in the new skills demanded by employers, but the need to do so is likely only to grow.

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