

# TECHNOLOGY, TASTES, AND DEMOGRAPHIC SHIFTS CONTRIBUTE TO JOB POLARIZATION IN THE U.S.

*This Policy Update is the first in a series examining occupation and employment patterns in metropolitan Chicago over the past several decades. This first Policy Update examines labor market trends at the national level and reviews economic research explaining these trends. The [second update](#) hones in on how our unique industrial mix and workforce shaped employment trends in the region. [The third](#) compares shifts in peer metropolitan areas.*

Over the past several decades, broad macroeconomic trends reshaped the composition of the U.S. labor market, including a growing demand for services, technological advancements, and a diversifying workforce. These structural shifts, combined with the 2007-09 recession, resulted in a greater number of high and low skill jobs relative to middle skill jobs. For workers, these changes reshaped skill requirements and the value of an education. For employers, these changes reshaped hiring and training practices.

[GO TO 2040](#) called for the Chicago region to develop strategies to prepare a high-quality, skilled workforce for the changing global economy. CMAP is working to better understand labor market shifts and the forces behind these trends to develop relevant recommendations that advance GO TO 2040 and inform the region's forthcoming comprehensive plan, [ON TO 2050](#). Empirical studies have analyzed forces behind national labor market shifts, but the effects of these forces vary by region warranting a deeper local analysis. This Policy Update reviews and synthesizes national findings to provide a foundation to understand employment trends in northeastern Illinois. map, 133 local governments (132 municipalities and one county) across northeastern Illinois have active sales tax rebate agreements.

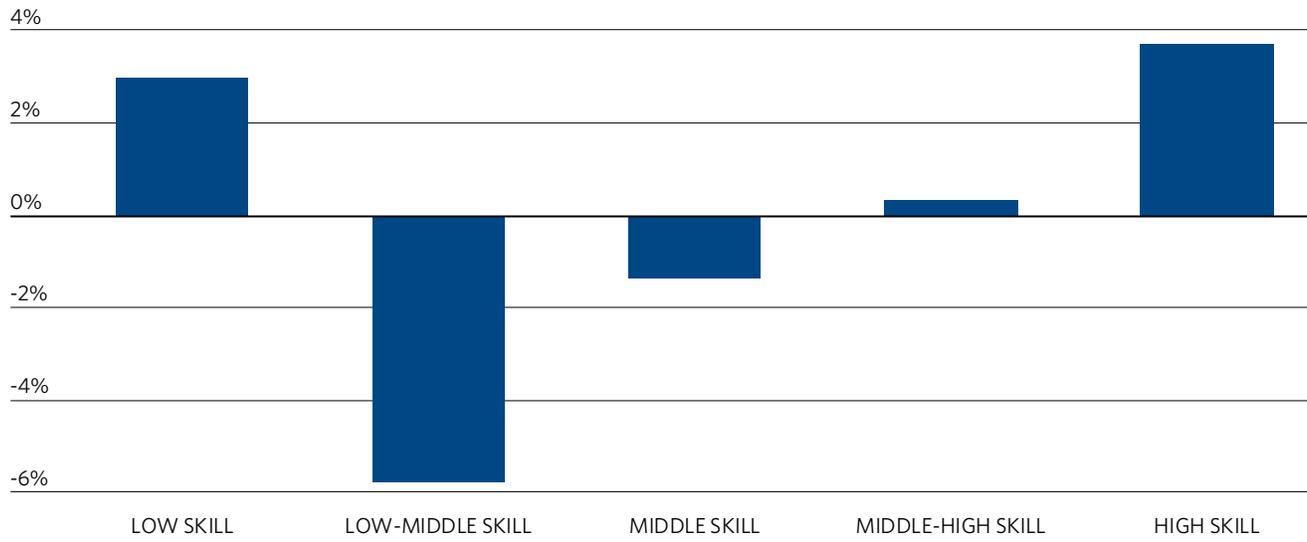
## Employment grew in high and low skill occupations

Although the total number of jobs in the U.S. increased between 1980-2016, growth was not distributed evenly across the economy—high and low skill jobs grew faster than middle skill jobs. This phenomenon has been termed job polarization.

### Change in share of U.S. employment, 1980-2016, by occupation skill level

Note: Median occupational wage in 1980 is used as a proxy for skill.

Source: Chicago Metropolitan Agency for Planning analysis of Integrated Public Use Microdata Series, 1980-2000 Decennial Census and 2010-16 American Community Survey data.



To study trends of job polarization, economists often group jobs that share similar levels of skill and types of tasks. For this analysis, occupations are categorized by skill level into five “skill buckets.” Figure 1 illustrates how the demand for labor between 1980-2016 concentrated in either low skill or high skill occupations, accompanied by an erosion of those in the middle.

Job polarization describes a shift—it refers to the growing share of employment of low and high skill workers in the overall workforce and the declining share of middle skill workers, as opposed to the growth or decline in the number of jobs by skill level. Various forces may affect employment growth across the economy, and studying the share of employment allows the researcher to identify occupations that are relatively more sensitive to these forces. For example, during the 2007-09 recession, goods-producing industries such as manufacturing and construction saw notable [employment losses](#), while services-producing industries were more resilient. Studying employment changes in share as opposed to number allows researchers to analyze labor market responses on a comparable scale.

Skill requirements are particularly hard to quantify. Proxies such as educational attainment lack granularity and often fall short of capturing all the competencies required or attained throughout a career. Instead, economists often use [occupational wages](#) as a proxy for skill when assessing changes in the relative demand for workers in different occupations. Data shows that groupings of occupations are very similar when classified by either experience, education, or wages. Because data on occupational wages is readily available, economists generally agree that analyzing employment change by wage level offers a reasonable level of information to study labor market shifts.

### **Advancements in technology drove job polarization**

Technology is a key force behind the patterns of polarization illustrated in Figure 1. However, its effect on demand for any given occupation can vary widely and depends on the skills required and tasks performed in those jobs.

Figure 2 categorizes all occupations into one of four categories based on their respective [skills and tasks](#). Technology is more likely to automate a position, or decrease the demand for human labor, if it requires repeatedly performing routine tasks. By contrast, if a job requires demonstrating a high level of mental judgement and reasoning as opposed to manual skills, technology is more likely to augment a position, or increase the demand for human labor.

## Classification of select occupations by skills and tasks

Note: The occupations listed in this table are examples from the 2010 Standard Occupational Classification.

- High skill
- Middle skill
- Low skill

		TASKS	
		NON-ROUTINE	ROUTINE
SKILLS	Cognitive	Computer occupations Top executives Lawyers, judges, and related	Legal support workers Administrative assistants Information and record clerks
	Manual	Food and beverage serving workers Building cleaning and pest control workers Personal appearance workers	Assemblers and fabricators Material moving workers Extraction workers

Although polarization refers to the growth in employment share of high and low skill jobs, and decline in the share of middle skill jobs, these trends did not occur simultaneously or on an even trajectory. Non-routine, cognitive occupations (in blue) benefitted from enhanced telecommunications and the proliferation of data systems. Economists refer to phenomenon of these workers benefitting from these tools as skill-biased technological change (SBTC). Through SBTC, technology complements the tasks performed by workers in high skill occupations, boosting their productivity and employers' relative demand for their labor. Rising demand for statisticians in the era of big data exemplifies SBTC.

The decline in the employment share of middle skill jobs also contributed to patterns of job polarization. Between 1980-2016, technology depressed the relative demand for routine cognitive and routine manual occupations (in orange) as employers automated many [routine tasks](#). Generally, firms hire employees in positions where the benefits (increased production) outweigh the costs (salary or wage). As computers and other technologies became cheaper during the 1980s and 1990s, the relative cost of hiring a worker to perform various tasks increased, and employment in middle skill occupations fell. For example, a grocery store chain may hire fewer cashiers as the technology of self-checkout machines or other automation improves.

Technology had a direct role in the uptick of high skill jobs and the decline in middle skill jobs, but had limited direct effects on the change in demand for low skill, non-routine manual occupations (in yellow). These occupations require in-person interaction and physical adaptability, making them more challenging to either automate or augment with technology.

### **Many forces contributed to polarization**

Other macro trends can influence the labor market, including shifts in consumer preferences for goods and services, demographics factors, business cycle fluctuations, and changes in government policies. Technology often serves as the impetus for these factors, indirectly influencing patterns in the labor market. For example, as the share of high skill, high wage workers increased due to technological shifts, [demand also rose](#) for workers in personal service occupations, such as nannies and house cleaners.

[Demographic shifts](#) in the labor market similarly contributed to these preference-based shifts. For example, a larger share of women entering the labor market increased the demand for low skill service occupations to replace tasks women traditionally performed in the home, such as caring for children and the elderly.

Technology can also amplify the impact of structural shifts in the economy by accelerating the process of globalization. As technology advanced, it became increasingly feasible to access the international labor force or even to move entire production facilities abroad. Such off-shoring was particularly prevalent in occupations that require well-defined, routine tasks and do not require [face-to-face interaction](#). Despite popular perception, these types of jobs appear in all four quadrants of Figure 2. However, low skill jobs in personal care and service are the most difficult to off-shore. Improvements in shipping may allow manufacturers to operate anywhere in the world, but generally do not affect the personal care industry.

[Economic cycles](#) also contribute to job polarization. Manufacturing and construction industries tend to be sensitive to macroeconomic trends and disproportionately employ routine manual workers. Although employment may slow across all industries during a recession, these industries tend to have higher levels of lay-offs. Additionally, there is some evidence that the process of labor market polarization can [accelerate](#) during recessions, as the cost of automating and offshoring positions falls.

Finally, changes in [public policies](#) also affect employment levels as governments respond to fluctuating macroeconomic conditions. Federal, state, and local regulatory bodies have the potential to shift the economic benefits and costs of hiring low skill service workers. Changes in the minimum wage, public unemployment and disability benefits, or collective bargaining rights may also influence the degree of labor market polarization in an economy.

## **Looking ahead**

Patterns of labor market polarization differ among regions that operate with different policies, industry mixes, and workforce demographics. Understanding the extent and sources of job polarization in the Chicago region closely aligns with the over-arching principles of resilience and [inclusive growth](#) in the forthcoming ON TO 2050 plan.

The first step in building a [workforce](#) that is resilient to future technological and demographic shifts is analyzing the effects of realized shifts on employment demand. CMAP recommends widespread, coordinated actions among educational institutions, employers, and workforce development agencies to build career pathways and opportunities for upward mobility. Research has shown that economic opportunity and growth are intertwined. The loss of middle skill jobs is a worrisome trend that could slow growth and prosperity of the entire region, and thus warrants a deeper investigation.

The [second Policy Update](#) in this series will analyze employment and occupation changes in the Chicago region. The [third Policy Update](#) will provide context for understanding patterns of polarization in the Chicago region, by comparison with peer metropolitan areas.

## **About the Data**

Employment in this analysis is restricted to workers between the ages of 18-64 who are currently employed and work more than 20 hours a week. Military occupations are excluded. Median occupational wage in 1980 is used as a proxy for skill.

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