

# The Future of Employment, Wages, and Technological Change

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## Abstract

The United States and other advanced economies enjoyed a remarkable period of sustained growth and broadly-shared prosperity from the late 1940s to the early 1970s. After a series of crises from the mid-1970s to mid-1980s the character of jobs and the structure of earnings changed markedly but the causes continue to be debated. Most workers' inflation-adjusted wages have stagnated since the early 1980s, employment security has fallen, and inequality has grown. One set of explanations emphasizes structural and institutional forces, such as employment shifts from manufacturing to services, deunionization, import competition, declining value of the minimum wage, macroeconomic shocks, and changing wage norms. Others stress the interplay of the supply of and demand for human capital, citing rising returns to education and skills, which they attribute to the spread of computer technology. The debate has significant implications for understanding the likely course of future labor market trends.

## INTRODUCTION

The first decades following World War II are now remembered as the Golden Age of capitalism. Following the hardships of the depression and war years, pent-up demand from the war years, baby booms, and foreign assistance and postwar reconstruction outside North America contributed to a burst of economic growth in most Western countries and Japan. More than two decades of unprecedented economic growth, productivity improvement, high employment, low inflation, and rising incomes delivered relative affluence to previously excluded groups. In most countries, unions, relatively progressive taxes, greater social spending, and various forms of labor and economic regulation were now accepted features of the economic landscape to varying degrees. In contrast, international trade, foreign exchange markets, capital mobility, and immigration were generally more restricted than in the pre-war period. Large, bureaucratic corporations predominated over both small, proprietary firms and large firms run by tycoon-founders in the United States and to a lesser degree elsewhere. Product markets were

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often concentrated, predictable, or at least growing sufficiently for most large, established firms to feel secure and to extend more of the benefits of that security to their employees than ever before. While racial and ethnic minorities in the United States and women everywhere were subject to discrimination, this system of organized capitalism raised living standards for many working-class households, particularly if the head had a union job in heavy manufacturing, such as steel or autos.

There was a widespread recognition that working-class jobs remained physically demanding, often dangerous, frequently subject to authoritarian management, and rarely satisfying or interesting in themselves, at least for the vast majority of workers outside the skilled trades. However, high pay provided satisfactions off the job in the form of personal consumption, leisure activities, and comfortable family life. It is not surprising that the unraveling of this system since the 1970s generated concern and debates that persist. The breakdown of this high-growth, shared-benefit regime may provide lessons for the future, in addition to its intrinsic importance.

## FOUNDATIONAL RESEARCH

### THE EARLY PERIOD

Even during the first postwar era exaggerated claims that the working class in the United States and United Kingdom had joined a homogeneous middle class were easily deflated (Centers, 1949; Goldthorpe, Lockwood, Bechhofer, & Platt, 1967). However, the work of Kuznets (1955) in economics suggested a general tendency toward greater equality, as well as rising wealth, as economies modernized. Nations experience a temporary rise in inequality when employment is split between a relatively backward farm sector and modern business, but once the transition to modern production is complete the income distribution becomes more compressed at a higher average level. Without necessarily sharing the sweep of Kuznets' general theory, empirical researchers agreed that income inequality was significantly lower after the war than before 1929 and had remained remarkably stable throughout the postwar period (Blinder, 1980). Many economists took it for granted that inequality in advanced economies is naturally moderate and stable.

Contributing to the generally benign picture was the emerging theory of *human capital* within labor economics, which argued that the key determinant of an individual's earnings is his or her productivity potential, embodied in their education and skills, or similar meritocratic characteristics. Early research usually focused on individual earnings at a point in time, but could be extended to the study of trends and the shape of the overall earnings distribution.

Sociologist Daniel Bell (1976) contributed to this picture with his theory of an emerging post-industrial society succeeding industrialism, analogous to the previous shift from agricultural to industrial society. Science, theoretical knowledge, and information replace energy as the driver of the economy. High-skill services such as finance, consulting, health, education, social services, and government replace heavy manufacturing as the leading industries. Highly educated professionals, technical workers, and other experts replace blue-collar workers and line managers as the dominant occupations. Previous class divisions, inequalities, and tensions were predicted to fade as societies became increasingly middle class.

In opposition to postindustrial theory, Braverman (1974) argued job skill requirements are generally declining because firms are motivated to subdivide skilled jobs into simple, narrow tasks in order to hire cheaper labor that needs less training. Easier to monitor and more expendable, workers in deskilled jobs had less power to resist speedups. The assembly line was the machine-age exemplar, but automated manufacturing involved mostly easily taught machine monitoring and button pushing rather than technical skills or knowledge. Growing white collar occupations included clerical and retail jobs requiring few skills or easily deskilled, as in the case of secretaries replaced by dedicated typing pools and data entry clerks whose word processors tracked their keystrokes automatically. Braverman predicted greater class polarization as low-wage, low-skill jobs predominated, while a small managerial and professional elite benefited.

Segmented labor market theory agreed that the mass of jobs were low-skilled but recognized the postwar gains made by labor that Braverman omitted. Edwards (1979) explained these gains as a form of class compromise in which firms with the resources to do so offered concessions to workers to neutralize some of the discontents from the prewar era. They included relatively high pay, benefits, and job security, preferential access to internal promotion opportunities (*internal labor markets*), and some protection from arbitrary management through formal rules adopted voluntarily or under pressure from unions. Privileged blue-collar workers and others formed part of an enlarged *primary labor market*, albeit a subordinate segment, that was previously restricted to higher-level white-collar workers, who continued to occupy the upper or independent segment of the primary labor market.

Workers in *secondary labor markets*, by contrast, had low wages, minimal benefits, little job security and stability, low unionization levels, and labored under more personalistic and arbitrary management. These were dead-end jobs, offering few opportunities for upward mobility and uninsulated from competition with job-seekers in the external labor market outside the firm. Most jobs in retail, food service, hospitality, personal services, and small-scale or nonunion manufacturing were in this group, as were most part-time and

minimum wage positions. White males predominated in primary labor markets while minorities and women were overrepresented in the secondary segment.

In contrast to all the preceding theories that explained wages by workers' skills, segmented labor market theory focused on employer characteristics, such as ability to pay (profit margins), and other institutional or structural factors. Subordinate primary jobs were associated with greater firm size and capital intensity, less competitive product markets, firm-specific training, unions, and government regulations. For workers with the same low to moderate skill or education levels, there were good jobs and bad jobs, rather than a single labor market and wage, depending largely on the nature of the firm or other external conditions. Segmented labor market theory recognized the postwar middle class expansion and its inclusion of working-class jobs in an explanation based on trends in economic institutions rather than workers' skills. The distinction would prove central to subsequent debates over labor market trends.

#### CRISES AND RESPONSES

The charmed life of the United States' economy from 1946 to 1970 turned to a cursed life, racked by a succession of crises, from 1972 to 1989. At times almost everything seemed to go wrong at once. Productivity growth, the basic measure of an economy's efficiency and ability to generate new wealth, decelerated markedly. The rate of inflation jumped in response to deficit financing of the Vietnam War, political manipulations of the business cycle, and two shocks that raised oil prices per barrel more than tenfold in less than 10 years. Economic growth stagnated and unemployment in the 1970s averaged more than 6%. The Federal Reserve resolved to "break the back of inflationary expectations" by inducing the deepest recession since the 1930s as a kind of shock therapy. Unemployment in the early 1980s soared to levels not seen since the Depression.

Other advanced economies experienced similar problems in the 1970s but Japan rebounded with startling strength and overwhelmed numerous, traditionally strong American industries with a flood of low-price, high-quality products, including steel, autos, machine tools, cameras, televisions, video and audio equipment, computer hardware, photocopiers, calculators, watches, and microwave ovens, among others. An unprecedented wave of plant closures spread across the Midwest and other industrial regions from 1977 to the late 1980s.

Barry Bluestone and Bennett Harrison's *Deindustrialization of America* (1982) was the first systematic argument that something fundamental had changed. Instead of improving competitiveness through innovation and investment,

firms had responded to declining profitability in the 1970s by focusing on cutting labor costs. They moved operations to low-cost, nonunion locations or outsourced to low-wage subcontractors, bought and sold businesses like an investment portfolio churned for maximum short-term gain. High-skill post-industrial jobs boomed, but so did low-wage, dead-end jobs in fast food, discount retail, and personal services, while well-paid blue-collar jobs shrank. Secondary jobs accounted for a growing share of jobs while subordinate primary jobs were becoming scarcer and more similar to them. The expansion of the bifurcated service sector and the growth of top earnings were polarizing the earnings distribution (Tilly, Bluestone, & Harrison, 1986; for a popular treatment see Kuttner, 1983).

Reinforcing this trend was a resurgence of free-market and rugged individualist philosophies that dominated much of the prewar era but occupied the fringe during the postwar liberal consensus. An extraordinary wave of changes included wage and benefit reductions, anti-union campaigns, proactive downsizings, shareholder-centered management, growing use of part-time and contingent workers, relocation, outsourcing and offshoring, increased domestic and foreign sweatshops, more demanding output standards, greater use of pay for performance, less seniority-based pay, reductions in the inflation-adjusted minimum wage, financial and product market deregulation, privatization of government services, and social spending and tax cuts (Harrison & Bluestone, 1988). The new practices, assumptions, and institutional framework persisted long after the crises to which they were a response had passed and corporate profits had rebounded with the business cycle in the late 1980s, becoming more or less permanent and accepted (Kalleberg, 2009; Howell, 2013).

Robert Reich (1991, 175ff.) offered a synthesis and new twist on theories of deindustrialization and post-industrialism. Reich predicted and celebrated the growth of *symbolic analysts* whose work involves solving complex and unstructured problems, complex communication, and creative production. He lamented the hardships resulting from the inevitable shrinking of *routine production* jobs that involve following “standard procedures and codified rules” and includes data entry and routine software coding as well as factory work. He added a new dimension to previous views of *in-person service jobs*, such as such as cleaners, taxi drivers, food service, hotel workers, and child care providers, by observing that even though most are routine they are insulated from trade and offshoring because they must be provided in the same location as their customers. Nevertheless, the jobs are not insulated from immigrant competition and earned the label “service proletariat” in recognition of their generally low pay and precarious quality (Esping-Andersen, 1993).

Others were much more skeptical initially, arguing the trend was overwhelmingly toward the expansion of good jobs and that inequality had not grown when measured properly or were temporary effects of the business cycle, overvalued dollar, or the demographic bulge of less experienced women and baby boomers joining the labor market. International trade and employment shifts from goods to services were generally discounted. Indeed, manufacturing's faster productivity growth and declining share of consumer spending relative to services, described by Bell, would be expected to reduce manufacturing's share of employment (Kosters & Ross, 1987, 1988; Lawrence, 1983, 1984; Rosenthal, 1985; for a review see Loveman and Tilly, 1988). Declining manufacturing employment can reflect increased efficiency in the face of inelastic demand rather than declining competitiveness, although it is hard to see US firms in autos, steel, or consumer electronics as competitive leaders during that time.

By 1990, many of the skeptics' arguments lost favor. A new business cycle had peaked, new entrants were now experienced, and earnings inequality had not fallen. Analyses showed the losses and gains over the 1980s were a linear function of one's position in the earnings distribution, that is, wages at the low end were the most severely affected, the middle less so, while the higher percentiles gained. Most of the growth in inequality was within industries, rather than because of changing shares of employment in goods and services. Most striking for the human capital position was a sharp growth in earnings gaps by education along with increases in the share of jobs being filled by college-educated workers. According to standard economic logic, increases in both the relative price of labor and the quantity purchased could only mean that the demand for skill was rising faster than the supply. Because the wage trends coincided roughly with the diffusion of microcomputers in the 1980s and capital and skill were long believed to be complementary, the growth in the education wage premium was attributed to the spread of computers. Technology was driving a shift away from low-skilled jobs toward medium and especially high-skilled jobs; the problem was a shortage of good workers, not a shortage of good jobs. Because the pool of less educated job-seekers was not shrinking fast enough their wages fell and those of relatively scarce skilled workers were bid up (Juhn, Murphy, & Pierce, 1992; Katz & Murphy, 1992; for reviews see Levy & Murnane, 1992; Danziger & Gottschalk, 1995; Katz & Autor, 1999).

Cross-national research suggested similar trends in some, although far from all, other advanced economies, the differences often explained based on varying trends in the supply of college-educated workers, although institutional differences also received attention (Freeman, 1994; Freeman & Katz, 1995; for reviews see Gottschalk & Smeeding, 1997). There was always some ambiguity as to whether US inequality trends were due primarily to

deceleration in the growth of the supply of college-educated workers or computer-driven acceleration in the demand for them, but the latter tended to attract more attention. This theory of *skill-biased technological change* (SBTC) in one or another form remains the most widely accepted explanation of inequality growth, although initially it was mostly a working assumption.

Those favoring institutional explanations noted that roughly half the trend in inequality was as a result of growing inequality within education-experience-gender groups (*residual inequality*), that is inequality unrelated observable skill measures (Mishel & Bernstein, 1998). Most growth in both overall inequality and the education premium occurred in the early 1980s, quite early in the information technology (IT) diffusion process, and was over by the time it attracted mainstream attention. Inequality was more stable in the 1990s, when IT continued to progress (Howell, 1995, 1997; Handel, 2000, 2007). Most measures of productivity did not increase more rapidly in the 1980s than other decades (Mishel & Bernstein, 1998). Thus, the timing of inequality growth seemed very front-loaded compared to trends in computer diffusion and coincided more closely with the timing of severe macroeconomic and competitiveness shocks. Indeed, the recession in the early 1990s affected college-educated workers more severely than previous downturns. The distance between the middle and low end of wage distribution stabilized in the early 1990s and reversed itself somewhat in the late 1990s, a period when internet use burgeoned and, as it happens, unemployment fell to its lowest level since the late 1960s. Workers in IT and other technical occupations also did not seem to gain more than comparably educated professional workers since 1980, somewhat anomalous for a theory based on their pivotal role in transforming production processes (Bernstein & Mishel, 2001; Handel, 2003; Lemieux, 2008; Teitelbaum, 2014). Studies also found the declining the real value of the minimum wage and unionization rates explained substantial portions of inequality growth in the 1980s (DiNardo, Fortin, & Lemieux, 1996; Fortin & Lemieux, 1997).

### CUTTING EDGE RESEARCH

The first study drawing a direct connection between computers, wages, and skills showed a very large wage premium for computer use at work itself, interpreted as a reward for computer skills; this effect also explained part of the rising education premium (Krueger, 1993). Numerous studies of the computer wage premium in various advanced economies followed (for a review see Handel, 2003). DiNardo and Pischke (1997) cast doubt on this line of research when they reported similar wage differentials in Germany associated with using calculators, telephones, and pens or pencils at work, or even sitting down while working. They concluded the wage differentials

associated with computer use were not reliable indicators of the payoffs to specific skills and likely reflected more general qualities of computer users or their jobs. Many later studies continued to take the computer wage premium at face value, while others found evidence for the skeptical (Handel, 2007), as well as the original (Spitz-Oener, 2008) interpretation. Other studies sympathetic to SBTC agreed that computer skills *per se* were not a major source of skill upgrading (Levy & Murnane, 1996; Bartel, Ichniowski, & Shaw, 2000; Autor, Levy, & Murnane, 2002, p. 440).

One researcher put the question succinctly: “By What Means Does Information Technology Affect Employment and Wages?” (Shaw, 2002). There was a common feeling that “higher level problem-solving skills have almost certainly increased in value with the availability of computers” (Executive Office of the President, 1996, p. 202). However, case studies of factory automation, for example, found generally modest change in reading, arithmetic, or other skill requirements (Fernandez, 2001; Keefe, 1991; Milkman & Pullman, 1991) and no increase in educational requirements (Bartel *et al.*, 2000), although skilled workers sometimes needed significant training and broader knowledge to maintain computer-based equipment. Increased computerization at a bank relieved low-level accountants of routine copying, computational, and data entry tasks, permitting more time for problem-solving, but this meant mainly more time to use skills that had been part of their prior educational preparation rather than qualitative upgrading of the job’s requirements, which were fairly repetitive in any case (Levy & Murnane, 1996). Computers were an integral part of the work of managers and professionals but no one showed that most office software was either difficult to learn, had large effects on other knowledge or skill requirements, or raised educational requirements within occupations.

If using computers did not change greatly the skill content of jobs, IT might have affected skill demand by altering the relative sizes of differently skilled occupations. Automation can eliminate less-skilled jobs, such as factory operatives, data entry clerks, and telephone operators. The power of office IT systems may open new opportunities for high-skill positions, such as financial analysts, market researchers, and data analysts, as well as middle- to high-skill positions related to IT itself, such as network administrators and web site designers. However, two problems in isolating such effects are precomputer occupation trends toward greater professional and associate professional jobs and fewer blue-collar jobs across advanced economies, and the generally gradual rates of occupational change regardless of period (Gagliani, 1986; Handel, 2012; Howell & Wolff, 1991; Wyatt & Hecker, 2006).

While some studies have found associations between IT investment and skill-biased changes in employment composition (Berman, Bound, & Griliches, 1994; Autor, Katz, & Krueger, 1998), others with more direct



measures of technology adoption often found slight compositional effects (Doms, Dunne, & Troske, 1997; Fernandez, 2001; Handel, 2003, p. 60f.; Handel, 2004; Milkman & Pullman, 1991). There seems little doubt, however, that clerical workers in general and especially those in database-intensive industries such as banking and insurance are declining in relative numbers and likely being replaced by IT (Handel, 2003). However, confidence in this conclusion must be weighed against the generally better performance of women's wages since 1980 compared to men's wages, although women's educational attainment rose faster and their workforce attachment grew much stronger in this period, as well (Blank, 2011).

As the stabilization and contraction of earnings inequality below the median and its difficulties for the standard SBTC account became clearer, Autor, Levy, and Murnane (2003) proposed a modified version based on current thinking in computer science. Middle-skill job tasks that can be reduced to a set of explicit rules can be captured in a computer program more easily than either higher- or lower-skill tasks involving tacit knowledge, judgment, intellectual flexibility, generalized problem solving, creativity, and complex communication, but also visual processing, finger dexterity, and motor skills in irregular or uncontrolled contexts, such as operating a vehicle, janitorial work, and other service proletariat tasks. These middle-skill programmable tasks have come to be called *routine*, which is somewhat confusing given its usual association with low-skill work. By decreasing the number of middle-skill jobs while low-skill jobs have increased, wages at the bottom have been pushed up and wages in the middle of the distribution have softened. In this demand–supply framework, technology-driven skill polarization has decreased wage polarization below the median while increasing it above the median, consistent with observed patterns in the late 1990s.

A literature too large to summarize has emerged supporting this view (Spitz-Oener, 2006; Goos and Manning, 2007) and rejecting it thoroughly, including evidence that the posited skill trends are not visible in the 2000s (Mishel, Schmitt, & Shierholz, 2013). Among the points that are clear is that the concept of “routineness” in the sense of computer programmability is very difficult to operationalize and has no consensus measure, occupational composition has changed gradually in the direction of upgrading throughout the postwar period in most advanced economies rather than showing clear acceleration since the widespread introduction of computers (Handel, 2012), and international trade, particularly low-cost Chinese imports, have played a significant role in the accelerated decline of manufacturing employment since China's accession to the World Trade Organization in 2001 (Autor, Dorn, & Hanson, 2013). There is also renewed interest in the number of domestic jobs that can be moved offshore, although actual magnitudes of effects are even more difficult to determine (Blinder & Krueger, 2013).

## KEY ISSUES FOR FUTURE RESEARCH

Most researchers today would agree on certain key points. Although trends are not uniform, the dominant tendency is in the direction of an upgrading in the skill requirements of jobs, rather than deskilling, as Braverman argued. Employment shifts from manufacturing to services cannot be interpreted as a uniformly positive post-industrial stage in the economy's evolution, as Bell envisioned. There are numerous service industries with predominantly low-skill, low-wage jobs (e.g., food service, retail) and even some of the exemplars of knowledge industries have numerous jobs that are either low-skill, low-paid, or both, such as healthcare. There is no question that inequality grew substantially and most rapidly in the 1980s and most inequality growth since the mid-1990s has been between the top of the earnings distribution and the rest; the middle and lower percentiles have stopped moving further apart. The losses in manufacturing reduced an important source of middle-class incomes for people holding working-class jobs, although the exact causes are debated. However, global markets are more integrated than before and even if manufacturing imports from China begin to wane, a rebound in manufacturing employment is unlikely to be large enough to turn back the clock. Clerical jobs have declined much more gradually since 1980 after a century of growth and it is likely that IT is partly responsible. Offshoring of white-collar work, including middle- and high-skill jobs, has grown but its current levels and future path are largely unknown. Gaining a more concrete understanding of the effects of IT on job skill requirements, skill demand, and employment, and gauging the actual magnitude of offshoring and trade in finished and semi-finished goods, intermediate inputs, and services are key issues for future research.

Much less remarked on in the literature and quite distinct from the diffusion of computers is the large role that the healthcare and related fields will continue to play in job growth, reflecting population aging, spending patterns, and other factors specific to that market (Richards & Terkanian, 2013).

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