Stratagies for Improving Economic Mobility of Workers

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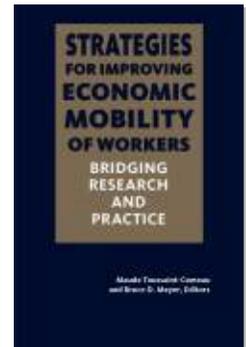Published by W.E. Upjohn Institute

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Past Trends and Projections in Wages, Work, and Occupations in the United States

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It is widely recognized that inequality of labor market earnings in the United States has increased dramatically in recent decades. This may be seen in Figure 3.1, adapted from Autor, Katz, and Kearney (2008), which plots the growth of real hourly wages of U.S. workers (both male and female) by earnings percentile for the years 1973 through 2005. Over the course of more than three decades, wage growth was weak to nonexistent at the bottom of the distribution, strong at the top of the distribution, and modest in the middle. While real hourly earnings of workers within the bottom 30 percent of the earnings distribution rose by no more than 10 percentage points, earnings of workers at the ninetieth percentile and above rose by more than 40 percentage points.

What is less widely known, however, is that this smooth, monotonic growth of wage inequality is a feature of a specific time period—and that this time period has passed.[1] Figure 3.2, adapted from Autor, Katz, and Kearney (2006), shows that, consistent with common perceptions, the growth of wage inequality between 1973 and 1989 was strikingly linear in wage percentiles, with sharp drops in real wages at the bottom of the distribution and modest increases at the top.[2] Yet, starting in the late 1980s, the growth of wages became polarized, as wages experienced strong, ongoing growth in the top of the earnings distribution (at or above the seventieth percentile) and modest growth in the lower tail of the distribution (at or below the thirtieth percentile). Notably, the portion of the wage distribution that saw the least real earnings growth between 1989 and 2005 was the middle, roughly the group of earners between the thirtieth and seventieth percentiles of the distribution.[3]

**Figure 3.1 Changes in Real Male and Female Hourly Wages by
Percentile, 1973–2005**
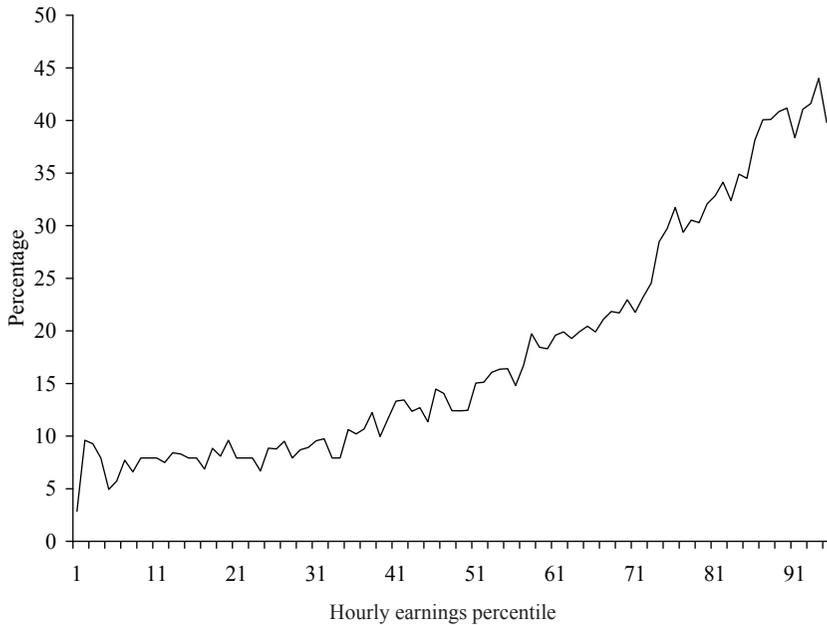
NOTE: Figure represents March CPS data for earnings years 1963–2005, full-time,
full-year workers ages 16 to 64 with 0 to 39 years of potential experience whose class
of work in their longest job was private or government wage/salary employment. Full-
time, full-year workers are those who usually worked 35-plus hours per week and
worked 40-plus weeks in the previous year. Weekly earnings are calculated as annu-
al earnings divided by weeks worked. Calculations are weighted by CPS sampling
weights and are deflated using the personal consumption expenditure (PCE) deflator.
Earnings of below $67/week in 1982 dollars ($112/week in 2000 dollars) are dropped.
Allocated earnings observations are excluded in earnings years 1967 forward using
either family earnings allocation flags (1967–1974) or individual earnings allocation
flags (1975 earnings year forward).
SOURCE: Autor, Katz, and Kearney (2008).

Thus, the periods of 1973 to 1989 and 1989 to 2005 present two distinct
periods of rising inequality: one of diverging wages throughout the dis-
tribution, a second of polarizing wage growth.

What explains the polarization since 1990?[4] It is fair to say that
the question has not yet received an entirely satisfactory answer. One
potentially promising—though surely incomplete—explanation lies in

**Figure 3.2 Change in Real Male and Female Hourly Wages by
Percentile, 1973–1989 and 1989–2005**

SOURCE: Autor, Katz, and Kearney (2006), and author's calculations based on data
from the U.S. Census Bureau's Current Population Survey, produced by Unicon
Research Corporation.

the changing demand for job tasks spurred by the remarkable spread of
computerization. The price of computer power has fallen by roughly
one-third to one-half each year for several decades (Berndt and Rappa-
port 2001). Processing tasks that were unthinkably expensive 30 years
ago, such as searching the full text of a university's library for a single
quotation, are now so cheap that the expense is trivial. This rapid, sec-
ular price decline creates enormous economic incentives for employ-
ers to substitute cheap computers for expensive labor in performing
workplace tasks. Simultaneously, it creates significant advantages for
workers whose skills become increasingly productive as computeriza-
tion advances.

But what *are* the tasks that computers perform?[5] One is immedi-
ately tempted to answer, "Everything." Indeed, it is hard to think of
a quotidian activity—from checking the weather forecast to investing
our retirement savings—that doesn't involve using a computer in one

way or another. Yet, although computers are everywhere, they don't do everything—far from it. In fact, computers have a very specific set of capabilities and limitations. Ultimately, the ability of a computer to accomplish a task is dependent upon the ability of a programmer to write a set of procedures ("rules") that directs what the machine does at each possible contingency. This means that computers are "good" at the things that people can program them to do—and inept at everything else.

For example, computer programs can play an unbeatable game of checkers and a nearly unbeatable game of chess. These games follow well-described rules and so are reasonably straightforward to program. In the workplace, computers accomplish countless data processing and clerical activities such as sorting, filing, calculating, storing, retrieving, and manipulating information. Similarly, computers now handle many of the repetitive assembly and monitoring tasks on the factory floor. I refer to these procedural, rule-based activities as "routine" tasks.

Yet there are many essential tasks that workers perform daily for which programmers and engineers do not know "the rules." One such set of tasks is abstract thinking—for example, developing a hypothesis, making a persuasive argument, creating a new idea or product, or motivating and managing a group of workers. These abstract thinking tasks require creativity, intuition, and insight. Though all of us have ideas and insights, the science of programming computers to do likewise is still in its infancy. Thus, for the moment, abstract thinking tasks require educated, creative, and clever people. Moreover, computerization likely raises the productivity of workers performing abstract tasks. For example, lawyers accomplish faster and more thorough case research by tapping into legal databases. Engineers develop products more quickly when assisted by computer-aided design tools. Financial professionals using powerful machines handle much larger volumes of client money than was feasible in the paper-based era. There is abundant evidence that the demand for highly educated "abstract" workers has increased in the computer era, and it is likely that the complementarity between computerization and abstract work is part of the explanation.

But education-intensive, abstract tasks are not unique in their (partial) immunity from automation. A second group of tasks that have proved remarkably hard to computerize are so-called manual tasks. These are tasks that require on-the-spot flexibility and adaptabil-

ity. Driving a truck through city traffic, waiting tables at a restaurant, checking passengers' IDs at the airport—these are all tasks that are easy for people but "hard" for computers. Why? Because they require complex and rapid interactions with unpredictable factors—erratic traffic, hungry restaurant patrons, and unfamiliar faces. Notably, these manual tasks do not require high levels of formal education.

One can glimpse the impact that computerization—more recently complemented by international outsourcing—is having on job tasks by considering the changing occupational structure of U.S. employment.[6] Table 3.1, adapted from Autor and Dorn (2008), reports the educational level and employment shares in six major occupational groups covering all of U.S. employment: 1) managerial and professional specialties; 2) technicians, sales, and administrative support; 3) precision production, craft, and repair; 4) service occupations; 5) operators, fabricators, and laborers; and 6) farming, fishing, and forestry occupations. The highest skilled of these occupational categories is managerial and professional specialty occupations, followed (at some distance) by technicians, sales, and administrative support. The four remaining categories—each averaging half the size of the first two—are demonstrably less education-intensive. Whereas in the year 2000 high school dropouts made up 2.2 percent of employment in professional and managerial jobs and 6.7 percent of employment in technical, sales, and administrative support jobs, they composed 20-plus percent of employment in the four remaining categories.

Growth has not been uniform across these six categories. Figure 3.3 shows that managerial and professional specialty occupations—the highest-skilled category—experienced consistent, rapid growth between 1980 and 2005, gaining 7.1 percentage points as a share of overall employment over those 25 years, a 30 percent increase. In contrast, employment in the "middle skill" group of technical, sales, and administrative support occupations showed an inverse U-shaped pattern over this period, expanding in the 1980s and then contracting to below its initial 1980 level over the next 15 years (consistent with the growing substitution of technology for routine tasks). Most strikingly, employment shares in three of the four low-skill occupations fell sharply in each decade.[7] For the entire period of 1980–2005, farming, forestry, and fishery occupations contracted by more than 50 percent as a share of employment; operators, fabricators, and laborers contracted

Table 3.1 Descriptive Statistics for Main Census Occupation Groups in 2000

	Employment share	Median hourly wage ($)	% high school dropout	% no college	% female	% nonwhite	% foreign-born
All occupations	100.0	13.58	12.1	39.3	42.1	21.6	14.2
Service occupations	13.4	9.40	21.3	55.1	51.3	30.8	19.7
All occupations except service occupations	86.6	14.42	10.7	36.8	40.8	20.1	13.3
Managerial and professional specialty occupations	30.2	19.23	2.2	11.4	46.5	16.2	11.8
Technicians, sales, and administrative support	28.8	12.50	6.7	35.0	58.8	20.8	11.6
Farming, forestry, and fishery occupations	1.3	7.50	33.0	67.2	14.9	20.6	22.3
Precision production, craft, and repair occupations	12.3	14.40	19.9	60.4	8.6	18.7	14.3
Operators, fabricators, and laborers	14.0	11.49	27.3	71.9	22.2	28.3	18.6

NOTE: Statistics are calculated from census IPUMS 2000, 5 percent sample. All calculations are weighted by hours of annual labor supply and exclude those under age 18 or over age 65.
SOURCE: Autor and Dorn (2008).

Figure 3.3 Employment Share of Major Census Occupation Groups, 1980, 1990, 2000, and 2005
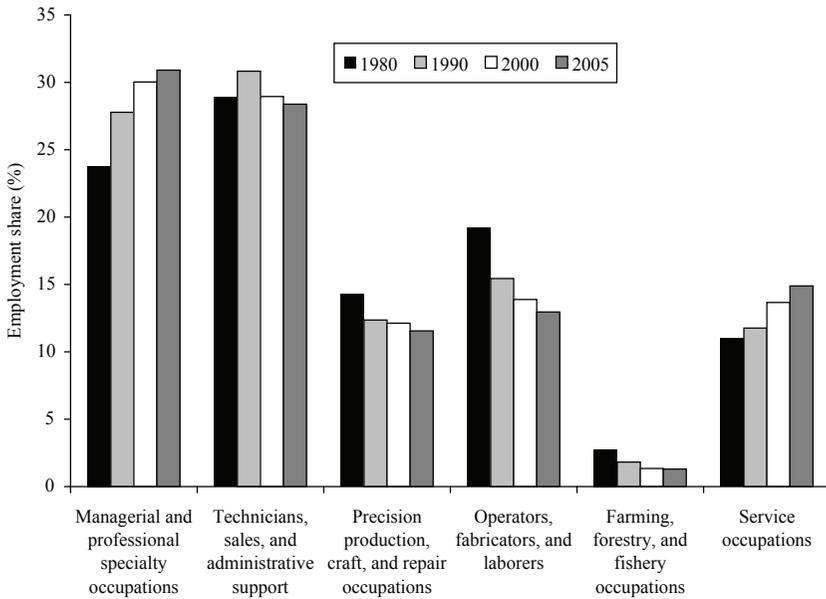
SOURCE: Autor and Dorn (2008), and author's calculations based on data from the University of Minnesota, Minnesota Population Center, Integrated Public Use Micro-data Series.

by 33 percent; and precision production, craft, and repair occupations contracted by 19 percent.

Standing in sharp contrast to these patterns of declining employment, however, is the experience of service occupations.[8] Despite being among the least educated and lowest paid occupations in the U.S. economy, service occupations had an employment that expanded in each decade between 1980 and 2005, rising from 11.0 percent of employment in 1980 to 11.8 percent in 1990, to 13.7 percent in 2000, and to 14.9 percent in 2005. Overall, employment in service occupations gained 35 percent, which is 6 percentage points more than the gain in employment shares of managerial and professional occupations during the same period. In fact, service occupations constitute the only major occupational category that is growing among noncollege workers (that is, those with high school or lower education).

Why should service occupations be the exception? Table 3.2 lists the major service occupations, the largest of which are food preparation and service, health service support (a group that excludes registered nurses and other skilled medical personnel), and buildings and grounds cleaning and maintenance. These are low-paying jobs; in 2005, 75 percent had hourly wages below the overall hourly median. However, from the perspective of our conceptual framework, what distinguishes these occupations is that each is highly intensive in "nonroutine manual" tasks—activities requiring interpersonal and environmental adaptability yet little in the way of formal education. These are precisely the job tasks that are difficult to automate with current technology because they are nonroutine. Moreover, these jobs are difficult to outsource because, in large part, they must (at least at the moment) be produced and performed in person.

Employment projections from the Bureau of Labor Statistics' (BLS) *Occupational Outlook Handbook, 2006–2007* (BLS 2006) support the view that low-education service jobs are likely to be a major contributor to U.S. employment growth going forward. The BLS forecasts that employment in service occupations will increase by 5.3 million, or 19 percent, between 2004 and 2014.[9] The only major occupational category with greater projected growth is professional occupations, which are predicted to add six million jobs, a 21.2 percent increase.[10] Like all forecasts, these should be treated as tentative. Historically, the BLS has underpredicted the growing demand for professional and managerial occupations (Bishop and Carter 1991; Freeman 2006).

This process of employment polarization—in which job growth is concentrated among both highly education-intensive, abstract jobs and comparatively low-education, manual jobs—presents both challenges and opportunities for the United States, as well as for other industrialized economies. The rising productivity of highly educated workers is good news; the return on investments in higher education has perhaps never been greater. But the growing importance of manual and service tasks presents a challenge. The positive news about rising demand for in-person service occupations is that it will tend to increase the earnings of less-educated workers. The less favorable news is that, even given rising demand, labor supply to services may be sufficiently elastic that wages stay low. Median real hourly wages in service jobs were $8.86 in 1980, $9.01 in 1990, $10.24 in 2000, and $10.28 in 2005 (all expressed

Table 3.2 Descriptive Statistics for Service Occupations in 2005, and Employment Growth Rates for 1980–2005

	Employment share in 2005	Median hourly wage in 2005 ($)	% female in 2005	% nonwhite in 2005	% foreign-born in 2005	% employment growth 1980–1990	% employment growth 1990–2000	% employment growth 2000–2005
All service occupations	14.9	9.07	51.9	32.2	23.4	6.7	16.2	17.8
Housekeeping, cleaning, laundry	0.9	7.09	82.1	43.9	48.2	−11.0	2.5	12.0
Protective service	2.3	15.55	20.1	27.0	77.0	16.1	8.7	12.3
Food preparation and service	4.0	7.21	53.5	31.5	27.5	4.7	11.6	14.4
Health service support	3.0	9.93	75.0	34.7	17.8	4.5	65.0	21.6
Building/grounds cleaning/maintenance	2.6	9.09	19.7	32.5	31.3	9.1	−7.9	31.7
Personal appearance	0.7	8.64	82.0	34.2	26.6	5.4	0.0	20.3
Child care	0.8	6.91	94.4	32.0	19.8	8.9	59.2	−5.1
Recreation and hospitality	0.4	10.37	47.9	29.6	18.0	17.6	85.0	10.8
Other personal service	0.4	10.80	57.8	20.3	15.5	17.2	0.0	47.1

NOTE: All calculations are weighted by hours of annual labor supply and exclude those under age 18 or over age 65.
SOURCE: Autor and Dorn (2008), calculated from census IPUMS of 1980, 1990, and 2005, 5 percent sample, and from the American Community Survey 2005, 1 percent sample.

in 2005 dollars). These hourly wage rates imply annual, full-time earnings of approximately $20,000 a year (of course, many service jobs do not provide full-time, full-year earnings). This income level exceeds the poverty threshold for the year 2000 of $19,350 for a family of two adults and two dependent children. Yet this is probably insufficient for families to make optimal investments in child-rearing and education.

How should education policy respond to this challenge? One might be tempted to reason that if earnings growth is concentrated among the most- and least-educated workers, educators should pursue a bimodal human capital investment policy: equipping all students with a solid foundation in basic skills while reserving high levels of preparation (leading to college and graduate education) for an elite. For a number of reasons, this argument is unattractive. First, as stressed above, the returns to human capital investments are quite high. In the late 1990s, the college wage differential stood at a near-historic level, and it has risen further in the subsequent decade (see Goldin and Katz 2008), so that it now stands at an all-time high.[11] Second, though earnings *growth* in low-education jobs exceeds that in middle-education jobs, earnings levels themselves are considerably higher in middle- than in low-education jobs—and this ranking is unlikely to reverse itself any time soon. Finally, universal, high-quality education is perhaps the only public investment proven to reliably foster opportunity, raise earnings, and increase well-being over the life cycle.[12] Thus, while it appears to be a legitimate worry that the polarization of earnings levels among U.S. households may serve to thwart economic mobility, the best insurance policy we have against this undesirable outcome is equipping citizens with skills that permit them to take full advantage of the opportunities that the future offers. It is not an overstatement to say that the case for extensive, universal investments in human capital is as strong at the outset of the twenty-first century as it has been at any time in the last century.

Notes

1. This observation was, to my knowledge, first offered by Mishel, Bernstein, and Boushey (2003).
2. The public-use Current Population Survey and Census of Populations data analyzed here do not cover the top several percentiles of the earnings distribution, where the most dramatic increases in real earnings have occurred during these decades (see Piketty and Saez 2003). Including these top percentiles would reveal even greater growth at the top throughout the years studied.
3. It bears noting, however, that all percentiles of the distribution fared better in the second half of the time period (1989 through 2005) than in the first (1973 through 1989), reflecting the acceleration of U.S. productivity growth commencing in the mid-1990s.
4. To my knowledge, Goos and Manning (2007) were the first to refer to the simultaneous growth of low- and high-skill jobs (at the expense of the middle) as a "polarization" of employment, thus coining that usage of the term to describe this phenomenon.
5. The "task view" of computerization presented here is formalized by Autor, Levy, and Murnane (2003) and elaborated on and advanced by Autor, Katz, and Kearney (2006, 2008); Dustmann, Ludsteck, and Schönberg (2007); Goos and Manning (2007); Levy and Murnane (2004); and Spitz-Oener (2006). Bartel, Ichniowski, and Shaw (2007) present detailed, representative evidence on the relationship between computerization, work organization, and productivity. Goldin and Katz (2008) provide a longer-term historical perspective on the relationship between technical change, work organization, and skill demand.
6. There is vast uncertainty about the degree to which international outsourcing will ultimately affect domestic labor demand. At present, most quantitative assessments of these potential impacts are preliminary or impressionistic (Blinder 2007; Kletzer 2006). Levy and Murnane (2006) consider the relationship between computerization and outsourcing through the lens of the "task" framework exposited above.
7. Operator, fabricator, and laborer occupations fell from 19.2 percent of employment in 1980 to 14.5 percent in 1990, to 13.9 percent in 2000, and to 13.0 percent in 2005. Production, craft, and repair occupations fell from 14.3 percent of employment in 1980 to 12.4 percent in 1990, to 12.1 percent in 2000, and to 11.6 percent in 2005. Farming, forestry, and fishery occupations fell from 2.8 percent of employment in 1980 to 1.8 percent in 1990, to 1.3 percent in 2000, and to 1.3 percent in 2005. The sources for these calculations are the census Integrated Public Use Microdata Series (IPUMS) files for 1980, 1990, and 2000, and the American Community Survey for 2005.
8. It is important to distinguish service *occupations*, a relatively narrow group of low-education occupations composing 13.4 percent of employment in 2000 (author's calculation from the census IPUMS), from the service *sector*, a broad category of industries including everything from health care to communications to real estate and constituting 81 percent of nonfarm employment in 2000 (BLS 2009).

9. The service employment measure used by the Bureau of Labor Statistics' *Occupational Outlook Handbook, 2006–2007* (BLS 2006) indicates a service employment share that is several percentage points higher than our calculations given in endnote 8 (17.7 percent versus 13.4 percent). The discrepancy stems from three factors: unlike our calculations, which are based on household data from the census, the BLS numbers use Current Employment Statistics (CES) data. The CES, as an establishment survey, double-counts workers who hold multiple jobs; our census-based numbers are weighted by hours of labor supply, and so part-time jobs (common in service occupations) are weighted down, whereas the CES data count all jobs equally. Furthermore, our census calculations exclude workers younger than 18, whereas the CES data include workers ages 16 and above. The service occupation in which the census and CES data are most different is in food preparation and service, where our data show a 3.5 percent employment share and the CES data show a 7.4 percent employment share. Despite these discrepancies in levels, we have no reason to believe that the qualitative employment trends in the census and CES data are at odds with each other.
10. The BLS category of professional occupations excludes managerial occupations and so is more disaggregated than the census category of professional and managerial occupations. Combined growth in professional and managerial jobs is projected at 8.2 million jobs, or 18.8 percent.
11. The college wage differential is at its highest level since 1915, which is as far back as representative U.S. data are available.
12. Recent work by Kopczuk, Saez, and Song (2007) finds little change in mobility over the course of a career among U.S. cohorts born between 1920 and 1950. However, these data do not speak to economic mobility across generations—in particular, to how likely children of low-income households are to reach higher echelons of the earnings distribution during their careers.

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