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Real Wage Trends, 1979 to 2018

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Summary

Wage earnings are the largest source of income for many workers, and wage gains are a primary lever for raising living standards. Reports of stagnant median wages have therefore raised concerns among some that economic growth over the last several decades has not translated into gains for all worker groups. To shed light on recent patterns, this report estimates real (inflation-adjusted) wage trends at the 10th, 50th (median), and 90th percentiles of the wage distributions for the workforce as a whole and for several demographic groups, and it explores changes in educational attainment and occupation for these groups over the 1979 to 2018 period.

Key findings of this report include the following:

- **Real wages rose at the top of the distribution, whereas wages stagnated or fell at the middle and bottom.** Real (inflation-adjusted) wages at the 90th percentile increased over 1979 to 2018 for the workforce as a whole and across sex, race, and Hispanic ethnicity. However, at the 90th percentile, wage growth was much higher for white workers and lower for black and Hispanic workers. By contrast, middle (50th percentile) and bottom (10th percentile) wages grew to a lesser degree (e.g., women) or declined in real terms (e.g., men).
- **The gender wage gap narrowed, but other gaps did not.** From 1979 to 2018, the gap between the women's median wage and men's median wage became smaller. Gaps expanded between the median wages for black and white workers and for Hispanic and non-Hispanic workers over the same period.
- **Real wages fell for workers with lower levels of educational attainment and rose for highly educated workers.** Wages for workers with a high school diploma or less education declined in real terms at the top, middle, and bottom of the wage distribution, whereas wages rose for workers with at least a college degree. The wage value of a college degree (relative to a high school education) increased markedly over 1979-2000. The college wage premium has leveled since that time, but it remains high. High-wage workers, as a group, benefited more from the increased payoff to a college degree because they are the best educated and had the highest gains in educational attainment over the 1979 to 2018 period.
- **Education and occupation patterns appear to be important to wage trends.** Worker groups studied in this report were more likely to have earned a bachelor's or advanced degree in 2018 than workers in 1979, with the gains in college degree attainment being particularly large for workers in the highest wage groups. For some low- and middle-wage worker groups, however, these educational gains were not sufficient to raise wages. Workers' occupational categories appear to matter as well and may help explain the failure of education alone to raise wages.

The focus of this report is on wage rates and changes at selected wage percentiles, with some attention given to the potential influence of educational attainment and the occupational distribution of worker groups on wage patterns. Other factors are likely to contribute to wage trends over the 1979 to 2018 period as well, including changes in the supply and demand for workers, labor market institutions, workplace organization and practices, and macroeconomic trends. This report provides an overview of how these broad forces are thought to interact with wage determination, but it does not attempt to measure their contribution to wage patterns over the last four decades. For example, changes over time in the supply and demand for workers with

different skill sets (e.g., as driven by technological change and new international trade patterns) are likely to affect wage growth. A declining real minimum wage and decreasing unionization rates may lead to slower wage growth for workers more reliant on these institutions to provide wage protection, whereas changes in pay-setting practices in certain high-pay occupations, the emergence of superstar earners (e.g., in sports and entertainment), and skill-biased technological changes may have improved wage growth for some workers at the top of the wage distribution. Macroeconomic factors, business cycles, and other national economic trends affect the overall demand for workers, with consequences for aggregate wage growth, and may affect employers' production decisions (e.g., production technology and where to produce) with implications for the distribution of wage income. These factors are briefly discussed at the end of the report.

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Introduction

Wage earnings are the largest source of income for many workers, and wage gains are a primary lever for raising living standards.[1] Evidence that wage growth has stagnated among low- and middle-wage workers has therefore been viewed with concern and has raised questions about the patterns and magnitudes of these trends.

This report addresses such questions by examining real (inflation-adjusted) wage trends over the 1979 to 2018 period.[2] Specifically, it uses cross-sectional data collected from the Current Population Survey (CPS), a nationally representative sample of workers, to estimate real hourly wages at the 10th, 50th (median), and 90th percentiles of the wage distribution in each year, and then explores how those wage levels change over time.[3] The sample comprises employed (full- and part-time), nonmilitary nonfarm wage and salary earners aged 25 to 64 years. Finally, all hourly wages were converted to 2018 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U).[4] **Appendix A** provides details on the methodology used in this report.

While wages are typically the primary component of compensation—accounting for about 70% of compensation for the average worker—non-wage compensation, such as employer-provided health insurance, paid leave, and retirement contributions, plays a role in living standards as well.[5] Workers may experience gains or losses in wages but overall compensation may not track these changes exactly because of the cost of non-wage compensation. For example, a 2015 study from the Bureau of Labor Statistics (BLS) found that while the overall median wage fell between 2007 and 2014, total compensation was statistically unchanged, mainly due to the rising costs of health insurance.[6] In addition, due to the relative costs and provisions of benefits for workers at

[1] According to Congressional Budget Office (CBO) analysis of incomes in 2015, labor earnings accounted for 71% of average market income earned by households in the lowest quintile of the income distribution; between 67% and 71% for the middle three quintiles; and 53% for the top quintile. At 32%, labor earnings make up a lower, but still significant, share of household income among the top 1%. CBO defines market income as labor income, business income, capital gains realized from the sale of assets, capital income excluding capital gains, and income received in retirement for past services or from other sources. Conceptually, these percentages underestimate labor income because they exclude business income, and some business owners contribute labor to their firms and are compensated in the form of business income in lieu of wages. CBO, *The Distribution of Household Income and Federal Taxes, 2015*, November 2018, https://www.cbo.gov/publication/54646.

[2] The analysis starts in 1979 because that is the first year for which comparable data to future years are available.

[3] The data used to create annual hourly wage distributions (1979-2018) are from the Current Population Survey (CPS) Outgoing Rotation Groups (ORGs). **Appendix A** documents methods used to address outliers (i.e., implausibly low or high wage reports), the Census Bureau's practice of "top-coding" information on earnings, and other issues.

[4] The CPI-U, which is a measure of the average change over time in prices paid by consumers for a market basket of goods and services, is commonly used to compare the real (inflation-adjusted) value of earnings or spending data at different points in time. The CPI-U, for example, is the most common index used to adjust state minimum wage rates. Other indices used to adjust for inflation in wage studies include the Consumer Price Index Research Series Using Current Methods (CPI-U-RS) and the Price Index for Personal Consumption Expenditures (PCE). As a point of comparison, from 1979 to 2018, the average annual increases in the CPI-U, CPI-U-RS, and PCE were 3.3%, 3.1%, and 2.8%, respectively. For a detailed description of indices used to adjust wages and a comparison of the values for different indices, see CRS Report R44667, *The Federal Minimum Wage: Indexation*, by David H. Bradley. There is no correction for regional price differences.

[5] In September 2018, about 32% of the average worker's total compensation was in the form of employer-provided benefits. See Bureau of Labor Statistics, U.S. Department of Labor, *Employer Costs for Employee Compensation – September 2018*, USDL-18-1974, Washington, DC, December 14, 2018, https://www.bls.gov/news.release/pdf/ecec.pdf.

[6] Kristen Monaco and Brooks Pierce, *Compensation Inequality: Evidence from the National Compensation Survey*,

different points in the wage distribution, trends in wage and compensation inequality may differ over time.[7]

Because the data are cross-sectional, the trends identified in this report describe patterns among *groups of workers* at different percentiles in the wage distribution, but not the experience of individual workers. That is, because the CPS does not track the wages of a fixed group of workers over long periods of time, a finding that median wages have stagnated over the 1979 to 2018 period does not necessarily mean that a worker earning the median wage in 1979 personally experienced zero wage growth over this period. Individuals can and do move throughout the wage distribution over time. Instead, wage stagnation at the median indicates that the wage level below which half the population earns has not risen considerably between 1979 and 2018, as might be expected if overall living standards had increased broadly (i.e., such that the entire wage distribution *shifted* upwards).

In summary, analysis of the data shows that overall wages rose in real terms over the 1979 to 2018 period at the top of the wage distribution, increased more modestly at the middle of the wage distribution, and rose to an even lesser degree at the bottom of the distribution. Within these overall trends, there were important differences in patterns across demographic groups (e.g., median wages for women increased, whereas those for men declined). Differential patterns of wage growth narrowed the gap between median hourly earnings of men and women (i.e., the gender wage gap), but other wage gaps did not show such change over time. Real wages fell for workers with lower levels of educational attainment (i.e., a high school degree or less) and rose for highly educated workers, contributing to a wage gap between workers with different educational attainment levels that grew markedly over the 1979 to 2000 period and has plateaued since then**.** The rising wage premium to post-secondary education has likely contributed to relatively high wage growth at the top of the distribution, because workers there have greater shares of college-educated workers. Occupational composition of worker groups appears to matter as well and may explain the failure of education alone to raise wages for some groups. The report closes with a brief discussion of three groups of factors—market, institutional, and macroeconomic—that are widely thought to contribute to wage patterns.

Real Wage Trends

This section describes trends in real hourly wages over the 1979 to 2018 period at selected wage percentiles for nonmilitary, nonfarm workers between the ages of 25 and 64; wage patterns are disaggregated by sex, race, Hispanic ethnicity, and education. Wage trends for low-, middle-, and high-wage groups are examined by plotting wages at the 10th, 50th, and 90th percentiles of each demographic group's wage distribution over the period of study.[8]

Bureau of Labor Statistics, U.S. Department of Labor, *Monthly Labor Review*, Washington, DC, July 2015, https://doi.org/10.21916/mlr.2015.24.

[7] For example, in the 2007 to 2014 period, BLS found that wage inequality was lower than compensation inequality due in part by more costly benefits for higher-wage workers. Kristen Monaco and Brooks Pierce, *Compensation inequality: evidence from the National Compensation Survey*, Bureau of Labor Statistics, U.S. Department of Labor, *Monthly Labor Review*, Washington, DC, July 2015, https://doi.org/10.21916/mlr.2015.24.

[8] Wage percentiles indicate the wage level below which a certain share of a population falls. For example, a 10th percentile of $12.00 for the overall population of wage earners indicates that 10% of wage earners have wages less than $12.00. Likewise, a 10th percentile wage of $9.75 for women indicates that 10% of female wage earners have wages less than $9.75. This report uses the conventional approach of studying wages at the 10th, 50th, and 90th percentiles to estimate wage trends for low, middle, and high-wage earners, respectively. As a check, the same analysis presented in this report was conducted at the 20th and 80th percentiles to test that these patterns were not unique to the 10th and 90th

Wage trends are examined separately within demographic groups because workers in these groups are not distributed proportionately within the overall wage distribution. A sole focus on the overall wage distribution would therefore mask important differences in wage trends between groups. For example, because workers at the top of the distribution are disproportionately male, white, and, non-Hispanic (see **Appendix B**), tracking trends only in the overall distribution provides information mainly for those workers and may miss trends among relatively high-earning workers in other groups. **Appendix B** provides detailed data on the composition of different parts of the wage distribution in 1979 and 2018.

In addition to trends, estimated wage levels (i.e., dollars per hour) are presented at various points in time and wages are compared and contrasted across worker groups. As is always the case, wage estimates are influenced by the methodology used to produce them. For example, potential outliers are addressed by excluding very high and very low wages from the sample; related studies that do not "trim" their data in this way may achieve different wage estimates at the various percentiles.[9] The methods used in this report are summarized in **Appendix A**.

As noted earlier, data used to analyze wage trends are cross-sectional, meaning that a separate nationally representative sample of workers is used to describe wages in each year. For this reason, trends in this section do not demonstrate wage patterns for a fixed set of workers. Individual workers can and often do move throughout the wage distribution over time, such that a worker at the 50th percentile in 1980 may be at a higher or lower percentile in subsequent years.[10]

Table 1 provides graphic presentations of real hourly wages across different demographic groups from 1979 to 2018. Also presented is the cumulative percentage change in real hourly wages at the 10th, 50th, and 90th percentiles between 1979 and 2018. It is worth noting that this measure is calculated using wage data only in those two years, and will therefore be very sensitive to year-to-year changes at the endpoints.[11] A negative cumulative percentage does not indicate, for example, that wages have fallen continuously over the entire 1979 to 2018 period.

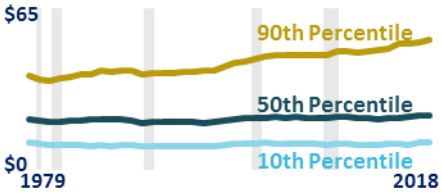
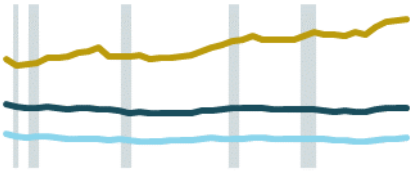
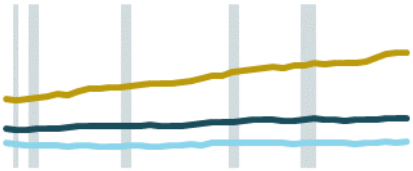
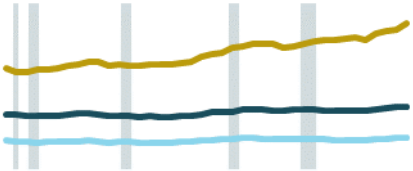
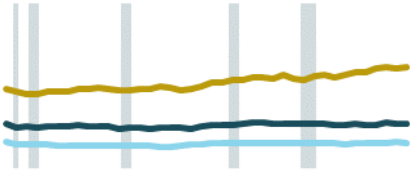
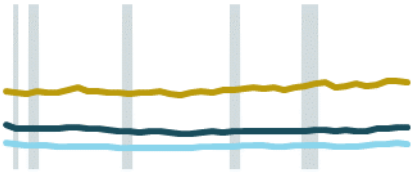
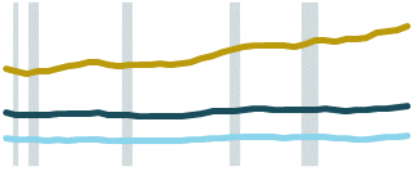
percentile wage trends. These checks confirmed that similar patterns of wage growth held across the demographic groups, with some exceptions. Cumulative wage growth at the 80th percentile, while lower than that at the 90th percentile, was generally positive (with the exception of Hispanic workers) and higher than that at the median. Hispanic workers experienced a cumulative wage *loss* at the 80th percentile (-1.2%) between 1979 and 2018. Cumulative wage growth at the 20th percentile tends to be lower than that at the median and close or higher than that at the 10th percentile, but this was not always the case. Black workers and Hispanic workers had higher cumulative wage growth rates at the 20th percentile than at the median.

[9] Similarly, the earnings data used in this study are "top-coded" for very high earners, which means that actual earnings are not observed above a given dollar level (called a "top-code"). There are several ways of addressing this empirical challenge; CRS's methods are described in **Appendix A**.

[10] In addition, wage trends in this study reflect patterns among employed workers. Unemployed workers and those not participating in the labor market are not included in the analysis. The large job losses that occurred during the 2007 to 2009 economic recession as well as the continued pattern of declining labor force participation rates since the late 1990s may affect wage trends, particularly at the lower end of the distribution. For example, if low-wage workers drop out of the labor force because they are discouraged by their earnings prospects, the reduction in labor supply (and compositional effects) may result in wages higher than they would be if such workers remained in the workforce. In this study, it is not possible to estimate the size of such an effect.

[11] For example, the cumulative percentage change between 1979 and 2018 in hourly wages for non-Hispanic black workers at the 10th percentile was -0.3% (**Table 1**). The cumulative percentage change between 1979 and 2017 for this group, however, was 2.1%; between 1979 and 2016 it was -0.9%. The year-to-year difference is in each of these examples driven entirely by changes in the 10th percentile wage level for non-Hispanic black workers over the 2016 to 2018 period.

Table 1. Real Wage Trends over 1979-2018, by Selected Demographic Characteristics

Demographic	Real Wage Trends	Cumulative % Change in Real Wages		
	Shaded Bars = Recessions	*10th percentile*	*50th percentile*	*90th percentile*
Overall		1.6%	6.1%	37.6%
Men		-13.3%	-5.1%	36.4%
Women		4.8%	25.7%	66.7%
White (Non-Hispanic)		8.2%	13.2%	45.6%
Black (Non-Hispanic)		-0.3%	1.2%	28.5%
Hispanic		-3.7%	-4.6%	11.4%
Non-Hispanic		6.7%	10.1%	42.7%

Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018. Recession data are from the National Bureau of Economic Research, at http://www.nber.org/cycles.html.

Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Periods of recession are shaded in gray. Dollar amounts are adjusted for inflation using the Bureau of Labor Statistics Current Price Index for All Urban Consumers (CPI-U); https://www.bls.gov/cpi/.

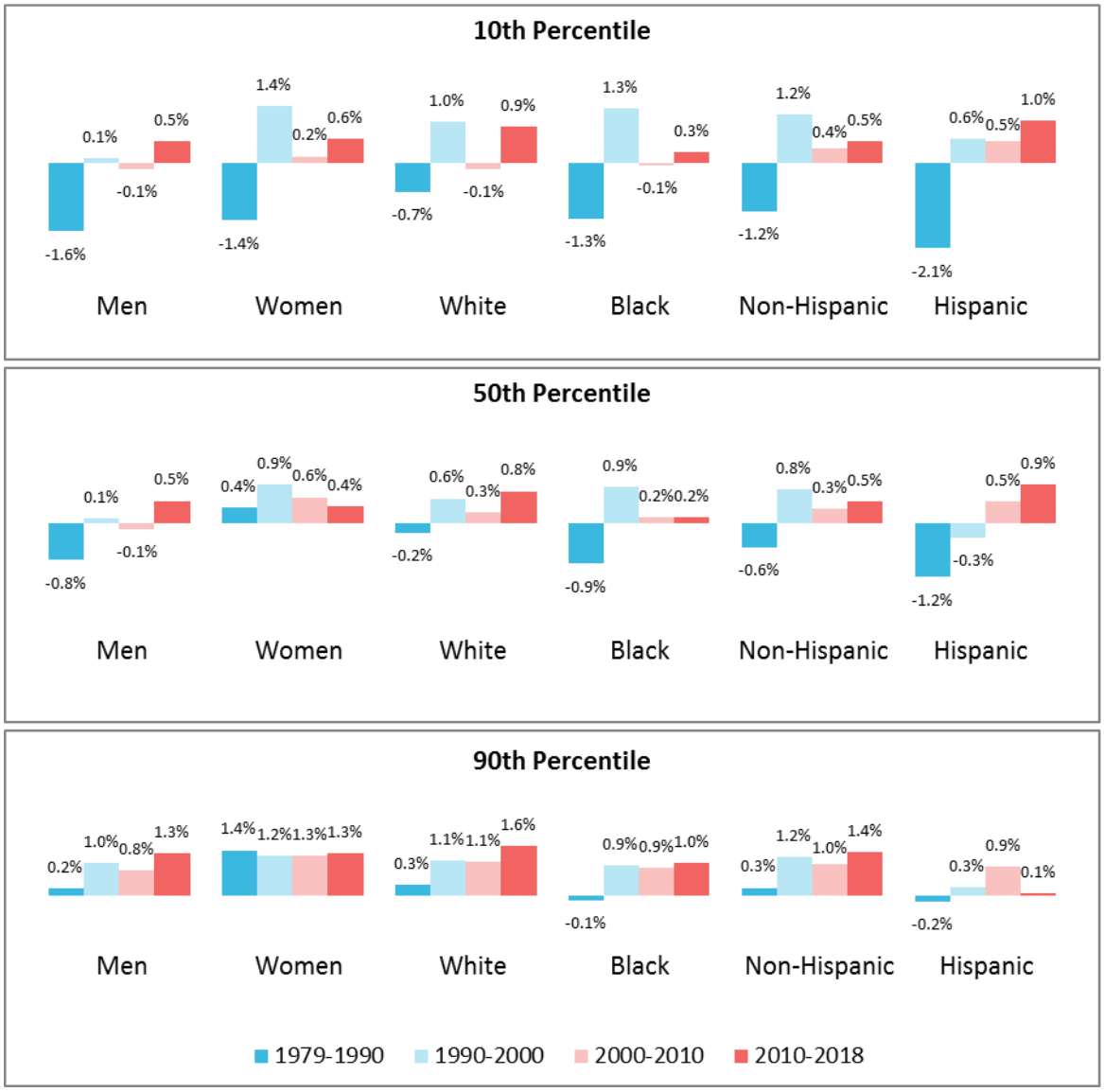
Wages at the 90th percentile increased across demographic groups, ranging from rates of 11.4% (Hispanic workers) to 66.7% (women). Overall, wages at the 90th percentile increased from an estimated $38.44 to $52.88 (a 37.6% increase) over the 39 years between 1979 and 2018, but the growth rate was not constant. After increasing by $3.15 ($38.44 to $41.59) over the 19 years from 1979 to 1998, wages at the 90th percentile grew by an estimated $11.29 over the 20 years from 1998 to 2018.[12]

Median wage trends were not uniform across demographic groups, with wages decreasing for some groups (e.g., men and Hispanic workers) but increasing for others (e.g., women). Overall, median wages increased from an estimated $20.76 to $22.00 (a 6.1% increase) over the 1979 to 2018 period. Wages at the 10th percentile followed a similar pattern (i.e., declining for some groups, but rising for others). Overall, wages at the 10th percentile increased in real terms from an estimated $11.07 to $11.25 (a 1.6% increase).

To explore how real wage trends evolved over the 1979 to 2018 period, **Figure 1** shows annualized wage growth rates over various time periods (roughly a decade each) by wage percentile and demographic group. Considering first wage growth at the 10th and 50th percentiles, **Figure 1** reveals that the 10th percentile wage declined in real terms during the 1980s for all groups, and, with the exception of women, the median (50th percentile) wage declined as well. In the 1990s, 10th percentile and median wages increased for nearly all demographic groups. This was followed by a general slowdown (and some modest declines) in real wage growth in 2000-2010, after which (i.e., 2010-2018) 10th percentile and median wages grew for all demographic groups. Annualized real wage growth at the 90th percentile was positive in all periods and for all demographic groups except black workers and Hispanic workers, for whom the 90th percentile wage declined slightly during the 1980s.

[12] Put another way, annualized wage growth was 0.4% over 1979-1998 and 1.2% over 1998-2018.

Figure 1. Annualized Real Wage Growth by Percentile and Demographic



Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018.

Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Dollar amounts are adjusted for inflation using the Bureau of Labor Statistics Current Price Index for All Urban Consumers (CPI-U); https://www.bls.gov/cpi/.

Wage Trends for Low, Middle, and High Earners by Sex, Race, Ethnicity, and Educational Attainment

Aggregate trends and overall averages can mask important dynamics within groups. For example, although women *as a group* saw sizable wage gains across the 10th, 50th, and 90th percentiles from 1979 to 2018, the trends and growth rates varied considerably between black and white women and between Hispanic and non-Hispanic women.[13] Similar variation occurred within other demographic groups. Further, comparing rates of change can be misleading because worker groups start (in 1979) at different base wages.[14] For example, women's wage growth over 1979-2018 at the median was 25.7%, compared to a 5.1% wage loss experienced by men at the median. However, the median wage for women in 2018 was *still lower than the male median wage* in the same year.

This section explores these patterns by disaggregating the major trends in real hourly wages by sex, race, and Hispanic ethnicity; these are presented in **Figure 2**, below. The discussion is organized by earner group—low wage (10th percentile), median wage (50th percentile), and high wage (90th percentile). It bears repeating that the data used to analyze wage trends are cross-sectional, and as such do not capture individuals' movements between earner groups (e.g., an individual worker may move from a lower to higher earnings group over time, or vice versa). In general, women in all demographic groups experienced rising wage levels at the 10th, 50th, and 90th percentiles, with the exception of black women and Hispanic women at the 10th percentile. Among male workers, the 10th percentile wage fell for all demographic groups between 1979 and 2018, and the median wage fell for black men and Hispanic men but increased modestly for white men. Wages at the 90th percentile rose for all male groups.[15]

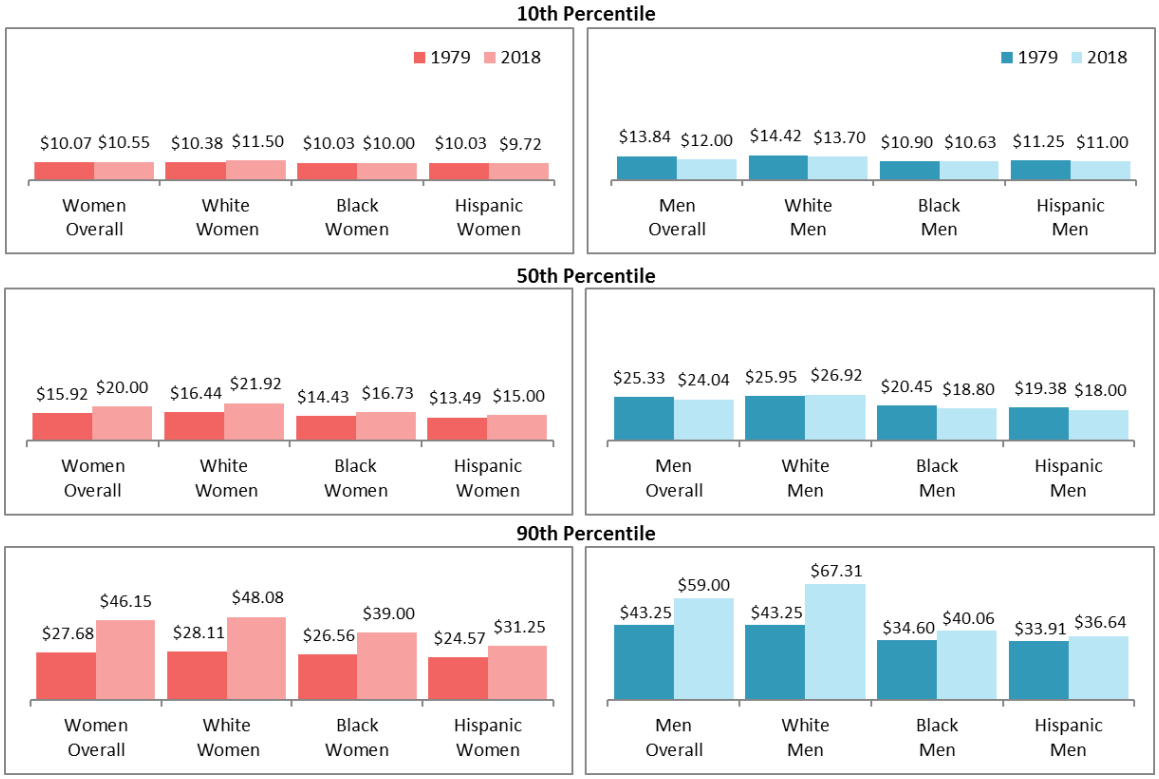
[13] The race/ethnicity categories in this report—white, black, and Hispanic—are mutually exclusive. That is, a "white" or "black" worker is non-Hispanic.

[14] For example, a $5 increase translates into 50% growth if wages were $10 in 1979 and into 25% growth if wages were $20 in 1979.

[15] In interpreting trends in wages for different groups, it is important to note that changes for one wage distribution (e.g., women overall) do not represent averages of more detailed demographic groups within this overall distribution. For example, the wage distribution for women overall is separate from groups within "women" overall – white women, black women, and Hispanic women, which each represent a distinct distribution. Thus, when interpreting the results, trends for groups for larger demographic are not the weighted average of the subgroups within that larger demographic.

Figure 2. Wages at Selected Percentiles, by Sex, Race, and Ethnicity, in 1979 and 2018

Wages in 2018 dollars



Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018.

Notes: White and black worker groups refer to non-Hispanic white and non-Hispanic black workers, respectively. Dollar amounts are adjusted for inflation using the CPI-U.

Low-Wage Workers

With the exception of white women, wages at the 10th percentile fell in real terms over 1979-2018 for all low-wage worker groups, although the degree of loss varied by sex and race. In 1979, wages at the 10th percentile ranged from $10.03 for black and Hispanic women to $14.42 for white men, whereas in 2018 wages in the 10th percentile ranged from $9.72 for Hispanic women to $13.70 for white men.

Men's wages at the 10th percentile fell by 13.3% ($13.84 to $12.00) from 1979 to 2018. Within the group of low-wage male earners, however, white men experienced the largest percentage decline from 1979 to 2018, a drop of 5.0% ($14.42 to $13.70), followed by a 2.5% decline for black men ($10.90 to $10.63) and a 2.2% decline for Hispanic men ($11.25 to $11.00).[16]

Women's wages at the 10th percentile rose by 4.8% between 1979 and 2018, from $10.07 to $10.55. When looked at by race and ethnicity, it appears that the overall improvement in wages among low-wage women was driven by the gains (10.8%) in hourly earnings for white women

[16] As noted earlier (see footnote 11), when analysis compares only two data points (in this case 1979 and 2018), findings are sensitive to year-to-year changes in at the endpoints. For example, when the 1979 to 2017 period is considered, the wages of Hispanic men at the 10th percentile had the largest percentage decline (by 8.9%), followed by white men (7.6% decline), and black men (6.0% decline).

($10.38 to $11.50). For low-wage black women, 10th percentile wages fell modestly from $10.03 to $10.00, and for low-wage Hispanic women the decline was 3.1% ($10.03 to $9.72).

Middle-Wage Workers

Wage trends at the median (50th percentile) diverged sharply between men and women from 1979 to 2018. Overall, median wages for men fell by 5.1% but rose by 25.7% for women. In 1979, median wages ranged from $13.49 for Hispanic women to $25.95 for white men, whereas in 2018 median wages ranged from $15.00 for Hispanic women to $26.92 for white men.

While median wages for white men rose by 3.7%, from $25.95 to $26.92, over the 1979 to 2018 period, median wages for black and Hispanic men fell. Median wages for black men fell by 8.0%, from $20.45 to $18.80, and for Hispanic men by 7.1%, from $19.38 to $18.00.

Median wages for white women had the largest increase at 33.4% ($16.44 to $21.92), whereas median wages for black women increased by 16.0% ($14.43 to $16.73) and for Hispanic women by 11.2% ($13.49 to $15.00).

High-Wage Workers

At the 90th percentile, wages grew across all groups, but the magnitude and levels varied by sex and race. Overall, wages for men at the 90th percentile rose by 36.4% and for women by 66.7%. In 1979, wages at the 90th percentile ranged from $24.57 for Hispanic women to $43.25 for white men, whereas in 2018 wages at the 90th percentile ranged from $31.25 for Hispanic women to $67.31 for white men.

Wages for white men at the 90th percentile rose by 55.6% from 1979 to 2018, from $43.25 to $67.31. Although wages at the 90th percentile for black and Hispanic men also rose over this period, they did not increase by as much. The 90th percentile wage for black men increased by 15.8% (from $34.60 to $40.06) and for Hispanic men by 8.1% ($33.91 to $36.64).

White women at the 90th percentile experienced the largest percentage increase in wages of any group examined in this study, with wages increasing by 71.0%, from $28.11 to $48.08. Among black women, the 90th percentile wage increased by 46.9%, from $26.56 to $39.00, and for Hispanic women the increase was 27.2%, from $24.57 to $31.25.

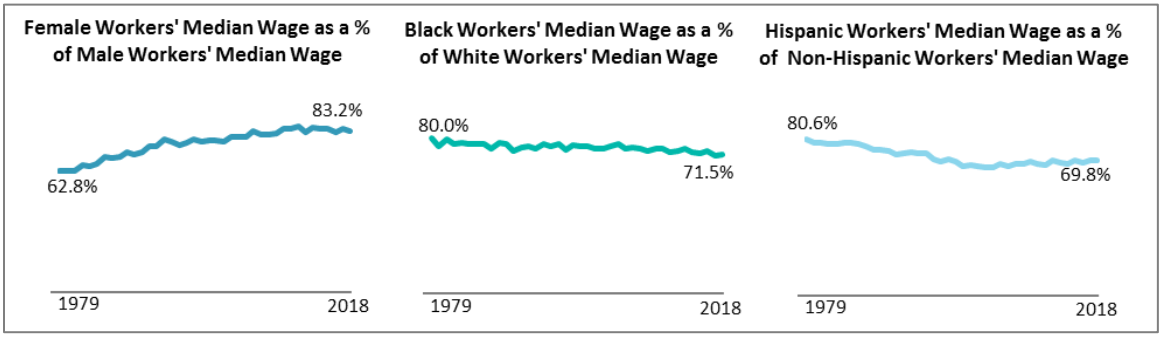
Wage Gaps

Differential wage growth over 1979 to 2018 affected wage inequality within and between demographic groups. The superior wage growth at the 90th percentile, alongside weaker growth or declining wages at the bottom half of the distribution, translated into growing wage inequality within all demographic groups, but groups varied by the degree of increased inequality. For example, the 10th percentile wage for men was 32.0% of the 90th percentile male wage in 1979; in 2018 this ratio fell to 20.3% (i.e., the 10th percentile wage moved further away from the 90th percentile wage over time). Among white men, the ratio fell from 33.3% to 20.4% between 1979 and 2018, and from 31.5% to 26.5% for black men. For Hispanic men the ratio also declined, but more modestly, from 33.2% (in 1979) to 30.0% (in 2018).[17]

[17] The smaller increase in wage inequality among Hispanic workers is due to relatively weak wage growth at the 90th percentile (i.e., it is not due to strong wage growth at the bottom of the distribution).

As measured at the median, strong wage growth among female workers and wage loss among men led to a narrowing of the gender wage gap. Women's median wage as a share of men's median wages), increased from 62.8% to 83.2%.[18] Other median wage differentials (**Figure 3**) did not show similar narrowing, however. The wage gap between black and white workers grew, as did the gap between median-wage Hispanic workers and median-wage non-Hispanic workers.

Figure 3. Median Wage Ratios, 1979-2018



Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018.

Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Periods of recession are shaded in gray. Dollar amounts are adjusted for inflation using the CPI-U. All graphics use the same scale: 0%-100% on vertical axis, and years 1979-2018 on the horizontal axis.

Wages by Educational Attainment: The College Premium

The rise in real hourly wages for workers with higher levels of educational attainment stands out among wage trends over the 1979 to 2018 period.[19] Specifically:

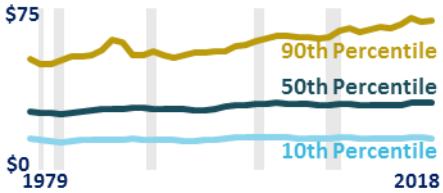
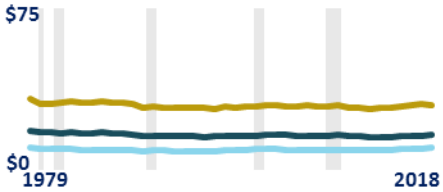
- Among workers with a bachelor's or advanced degree, wages at the 10th, 50th, and 90th percentiles rose in real terms between 1979 and 2018, with increases of 4.0%, 14.4%, and 34.3%, respectively (**Table 2**), suggesting rising demand for college-educated workers (that is not offset by rising supply of such workers), improved bargaining conditions for them, or both.
- Over the same period, wages declined markedly at the 10th, 50th, and 90th percentiles for workers with a high school diploma (or equivalent) or less education, suggesting increasingly few labor market opportunities for less-educated workers, a decrease in wage bargaining power, or both. The median wage for high-school-educated workers fell by 12.3%, whereas the wage at the 10th and 90th percentiles fell by 3.7% and 9.7%, respectively (**Table 2**).

[18] The gender wage *gap* is 100% minus the ratio of women's to men's median wages. So, the gap decreased from 37.2% (=100%-62.8%) in 1979 to 16.8% (=100%-83.2%) in 2018.

[19] The shares of workers in each category of educational attainment have shifted a great deal since 1979. In 1979, for example, about 31% of the population age 25 and older had at least some college education, whereas the other 69% had a high school degree (or equivalent) or less education. By 2018, these percentages were almost reversed—61% with at least some college and 39% with a high school diploma or less education. See U.S. Census Bureau, *CPS Historical Time Series Tables*, "Table A-1. Years of School Completed by People 25 Years and Over, by Age and Sex: Selected Years 1940 to 2018," Washington, DC, February 19, 2019, https://www2.census.gov/programs-surveys/demo/tables/educational-attainment/time-series/cps-historical-time-series/taba-1.xlsx.

- The higher-education wage premium—the percent difference between the median wage for bachelor's or advanced degree holders and the median wage for workers with a high school education or less—grew considerably from 1979 to 2000, from about 49.8% to 93.6%.[20] The premium has remained high since that time, but the growth in the gap has slowed; the premium was 95.3% in 2018.

Table 2. Wage Trends by Education and the Higher-Education Wage Premium

Education Group	Real Wage Trends	Cumulative % Change in Real Wage Levels over 1979-2018		
	Shaded Bars = Recessions	*10th percentile*	*50th percentile*	*90th percentile*
College Degree Holders		4.0%	14.4%	34.3%
High School Diploma or Less Education		-3.7%	-12.3%	-9.7%

Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018. Recession data (in gray) are from the National Bureau of Economic Research, at http://www.nber.org/cycles.html.

Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Periods of recession are shaded in gray. Dollar amounts are adjusted for inflation using the CPI-U.

Figure 4 shows real median wages for workers at five different levels of educational attainment from 1979 to 2018—less than a high school degree, high school degree or equivalent, some college (including associate degrees and non-degree-holders with some college education), bachelor's degree, or advanced degree. The data show falling real median wages for workers with less than a bachelor's degree over the 1979 to 2018 period and rising wages for workers with at least a bachelor's degree. One commonality across all education groups is that most of the changes, increasing or decreasing real wages, occurred in the 1980s and 1990s, with slower changes occurring since about 2000 across groups. Specifically, **Figure 4** shows the following:

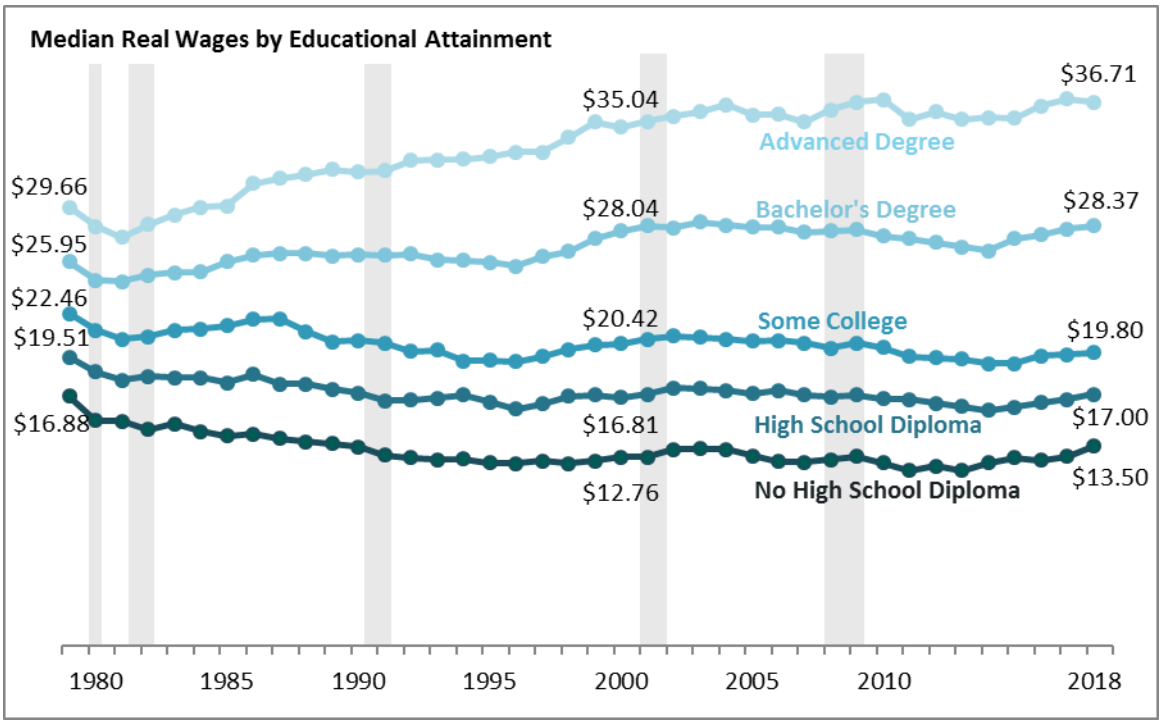
- Workers with less than a high school degree saw a fall in median wages from $16.88 in 1979 to $12.76 in 2000 (a 24.4% decline); between 2000 and 2018, wages increased by 5.8% to $13.50.
- The median wage for workers with a high school degree also fell, from $19.51 in 1979 to $16.81 in 2000; the median wage for this group increased modestly (1.1%) over 2000 to 2018, when the median wage was $17.00.

[20] The premium describes the difference between college-educated workers' median wage and high school (or less) educated workers' median wage, as a percentage high school (or less) educated workers' median wage.

- For workers with some college education, the median wage fell from $22.46 in 1979 to $20.42 in 2000 (a 9.1% decline) and $19.80 in 2018 (a 3.0% decline over the 2000 to 2018 period). Thus, about three-quarters of the total decrease occurred in the 1980s and 1990s.
- Although the median wage for workers with a bachelor's degree rose by 9.3%, from $25.95 to $28.37, over the 1979 to 2018 period, a considerable share of these gains (86%) occurred between 1979 and 2000.
- For workers with education above a bachelor's degree, median wages increased by $7.06, or 23.8%, from 1979 to 2018. Median wages for this group increased in the 2000 to 2018 period, albeit at a slower pace than before.

Figure 4. Median Wage by Educational Attainment

Wages in 2018 dollars



Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018. Recession data (in gray) are from the National Bureau of Economic Research, at http://www.nber.org/cycles.html.

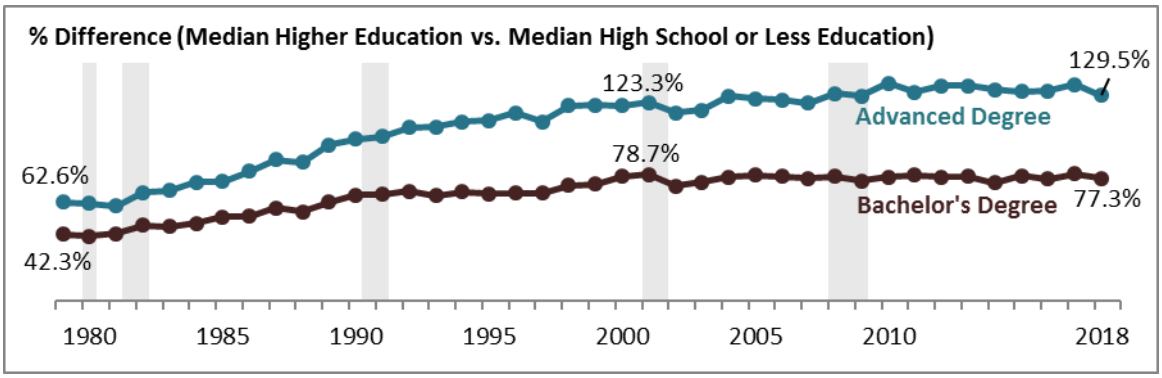
Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Periods of recession are shaded in gray. Dollar amounts are adjusted for inflation using the CPI-U.

Figure 5 shows the higher-education premium, which is the percentage difference between the median wages received by workers with a bachelor's degree and those with an advanced degree (shown separately), and the median wage received by workers with a high school degree or less.[21]

[21] The rising higher-education premium suggests that labor market conditions and wage-setting institutions evolved in a way that was relatively more beneficial for workers holding at least a bachelor's degree (e.g., demand for skilled workers increased relative to demand for high-school-educated workers); a body of research supports this view. Nonetheless, others have pointed out that the differential between college degree holders and high-school-educated workers may be overstated because highly educated workers—more so than less-educated workers—tend to

Although the wage premium for workers with higher education rose in the 1979 to 2000 period, the premium has been approximately flat since 2000 for workers with a bachelor's degree. For workers with advanced degrees, the wage premium continued to rise after 2000 but at a much slower rate than in the 1979 to 2000 period.

Figure 5. College Degree Wage Premium and Advanced Degree Wage Premium, Relative to a High School Education or Less



Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018. Recession data (in gray) are from the National Bureau of Economic Research, at http://www.nber.org/cycles.html.

Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Periods of recession are shaded in gray. Dollar amounts are adjusted for inflation using the CPI-U.

Skilled Trades

The previous section highlighted the strong wage growth experienced by workers with at least a bachelor's degree (relative to workers with a high school degree or less education) over the 1979 to 2000 period, and the high and sustained wage premium for these workers thereafter (see **Figure 5**). Such trends suggest elevated relative demand for skilled workers, whereas labor market conditions for less-skilled workers have become less favorable. Formal education is a common measure of worker skill, but it is not the only one. Workers can gain skills and expertise through nondegree postsecondary programs (e.g., certifications), apprenticeships, and on-the-job training (formally and informally acquired). Recent Bureau of Labor Statistics (BLS) data and projections point to strong and continuing demand for workers in this "middle-skill" range (i.e., education and/or training beyond high school but less than a college degree) in some occupations. For example, the occupations in **Table 3** typically do not require a post-secondary degree for entry positions had median annual earnings in 2018 that were greater than the overall median of $38,640 and were projected by BLS to grow by at least 50,000 jobs and with average or better employment growth between 2016 and 2026.

concentrate in cities with very high costs of living. See, for example, Enrico Moretti, "Real Wage Inequality," *American Economic Journal: Applied Economics*, vol. 5, no. 1 (2013), pp. 65-103.

Table 3. Occupations with High Employment Growth and High Earnings That Do Not Require a Post-Secondary Degree

Occupation	Typical Education Needed for Entry	Typical On-the-Job Training	Median Earnings (2018)	Employment (2018)
Dental assistants	Postsecondary nondegree award	None	$38,660	341,060
Self-enrichment education teachers	High school diploma or equivalent	None	$38,720	243,080
Heavy and tractor-trailer truck drivers	Postsecondary nondegree award	Short-term	$43,680	1,800,330
Licensed practical and licensed vocational nurses	Postsecondary nondegree award	None	$46,240	701,960
Carpenters	High school diploma or equivalent	Apprenticeship	$46,590	718,730
Computer user support specialists	Some college, no degree	None	$50,980	630,700
Plumbers, pipefitters, and steamfitters	High school diploma or equivalent	Apprenticeship	$53,910	438,070
Sales representatives, services, all other	High school diploma or equivalent	Moderate-term	$54,550	1,033,820
Electricians	High school diploma or equivalent	Apprenticeship	$55,190	655,840
Sales representatives, wholesale and manufacturing	High school diploma or equivalent	Moderate-term	$58,510	1,350,180
First-line supervisors of construction trades and extraction workers	High school diploma or equivalent	None	$65,230	598,210

Source: Bureau of Labor Statistics Occupational Employment Projections, at https://www.bls.gov/emp/ep_data_occupational_data.htm and Occupational Employment Statistics, at http://www.bls.gov/oes/.

Note: Median annual earnings across all occupations stood at $38,640 in 2018.

Worker Characteristics by Wage Group

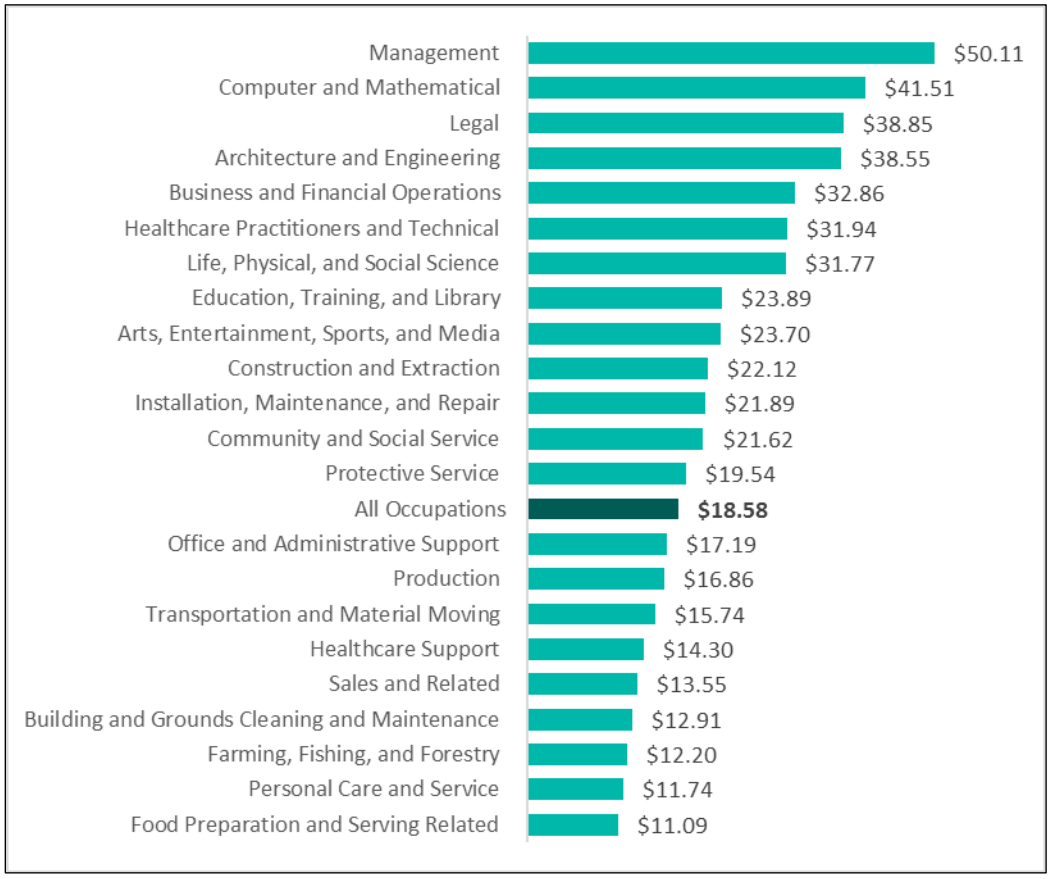
Table 1 shows a general pattern of strong wage growth at the top of the wage distribution over the 1979 to 2018 period, with slower growth or falling wages at the median and bottom of the distribution. Although these patterns hold in general across demographic groups, there is considerable variation in the magnitudes and patterns of change across sex, race, and Hispanic ethnicity. For example, whereas both men and women experienced significant wage growth at the 90th percentile of their respective distributions, wage growth among female workers was 30 percentage points higher than it was among men. And, although median wages for non-Hispanic workers rose over 1979 to 2018, median wages fell for Hispanic workers.

To better understand these cross-group differences, this section compares and contrasts workers' educational attainment and occupational distribution in 1979 and 2018.[22] Because greater

[22] Many other factors are likely to influence wage patterns and contribute to cross-group variations in wage growth, but are not addressed here. For example, changes in employment policies that affect bargaining power (e.g., no-hire rules)

educational attainment generally has a positive relationship with wages (**Figure 4**), worker groups that have seen educational gains over 1979 to 2018 are more likely to have experienced wage gains than those that did not (or did to a lesser degree).[23] Shifts in occupation may affect wage trends as well. Occupations require different mixes of skills and work experience, and where the workers meeting these requirements are scarcer, wages tend to be higher. The range of occupational wages is illustrated in **Figure 6,** which shows median hourly wages spanning $11.09 (food preparation and serving workers) to $50.11 (managers) in May 2018; across all occupations the median hourly wage was $18.58. As such, wages might grow faster for a demographic group that was more successful at shifting workers from low-paying to higher-paying occupations.[24]

Figure 6. Median Hourly Wages by Broad Occupation Group, May 2018



Source: Bureau of Labor Statistics, Occupational Employment Statistics, at http://www.bls.gov/oes/.

The next three tables show data on education levels and broad occupation group of low-wage workers in 1979 and 2018 (**Table 4**), middle-wage workers in 1979 and 2018 (**Table 5**), and high-wage workers in 1979 and 2018 (**Table 6**). For the purposes of this portion of analysis, low-wage workers are those with wages at the 5th to 15th percentiles, middle-wage workers are those with

and changes within occupation (e.g., in terms of worker requirements and the task content of certain jobs, such as nursing) are not explored here.

[23] For example, given that college degree holders, on average, earn higher wages than non-degree holders, a group that increased its share of college-educated workers over that time period might be expected to see greater wage gains than a group that did not—given the significant rise in the college premium between 1979 and 2018.

[24] Shifts in educational attainment and occupation are likely to be strongly correlated because some higher-paying occupations require a college degree.

wages at the 45th to 55th percentiles, and high-wage workers are those with wages at the 85th to 95th percentiles. The earnings groups are expanded by +/- five percentage points (in contrast to earlier analysis of workers at the 10th, 50th, and 90th percentiles) because this section describes the educational attainment and occupational composition of worker groups, and including more workers in each group allows for more precise estimate of education and occupational percentages. Overall, the analysis shows the following:

- Workers were more likely to have completed a bachelor's or advanced degree in 2018 than workers in 1979, with the gains in educational attainment being particularly large for workers in the highest wage group. The higher education level of low- and middle-wage workers in 2018, compared to 1979, is noteworthy in light of slightly rising or declining (depending on the specific demographic group) real wages over the 1979 to 2018 period; in general, wages tend to rise with education.
- Across all demographic and wage groups, workers lost employment shares in production work. Low-wage workers were concentrated in service jobs in 2018, whereas high-wage workers, to varying degrees, moved into managerial, executive, professional, and technical jobs. Occupational shifts for middle-wage workers differed across demographic groups.

The tables and discussion in this section describe worker characteristics by earnings group (low, middle, and high) in 1979 and 2018. As noted elsewhere, the data used in this report are cross-sectional and do not follow a fixed group of individuals over time. This means that the educational and occupational changes discussed below do not capture a set of individuals' education and job outcomes between 1979 and 2018, but the compositional change of workers in the three earner groups in these two years. For example, a rise in the share of college-degree holders in the middle-wage group does not necessarily reflect the share of middle-wage workers in 1979 that went on to complete a college degree.

Low-Wage Workers

Across demographic groups, low-wage workers increased their educational attainment between 1979 and 2018: the shares of workers who ended their schooling at or before high school graduation declined, and the shares of workers who completed some postsecondary education increased. Women in particular experienced strong gains in educational attainment, in absolute and relative terms. Over the 1979 to 2018 period, the shares of low-wage women with a bachelor's degree or higher rose from 4% to 16%, a rate on par with low-wage men in 2018. Concurrently, women's 10th percentile wages grew in real terms by 4.8% over the same period (see **Table 1**). But educational gains do not translate into wage growth for all groups. The share of low-wage male and Hispanic workers with increased education also rose from 1979 to 2018—albeit less than the gains compared to low-wage women—but these groups' wages at the 10th percentile fell in real terms, suggesting that other factors counterbalanced the upward pressure on wages typically generated by greater educational attainment.

The prominence of service occupations in 1979 and 2018 (28% and 33% of low-wage workers, respectively) and sharp decline in production jobs between 1979 and 2018 are noteworthy features of low-wage workers' occupational distribution.[25] Service occupations command a range of wages, but many pay less at the median than production jobs (see **Figure 6**). All demographic

[25] Service occupations include food preparation and service jobs, building maintenance, protective services, personal services (e.g., child care, hairdressers), and health care support jobs (e.g., home health aides, orderlies, dental assistants).

groups have a lower percentage of workers in production occupations in 2018 compared to 1979. Notably, workers that experienced declining wages over the 1979 to 2018 period were those that mostly experienced an increased share of employment in service occupations (e.g., male and Hispanic workers). This suggests that occupational shifts may help explain wage trends for low-wage workers.

Middle-Wage Workers

Among middle-wage workers, all demographic groups made considerable gains in educational attainment over the 1979 to 2018 period. For example, shares of workers with a high school diploma or less schooling declined by 27 percentage points among men and 46 percentage points among women, and shares of college degree holders increased.

In addition to educational gains, women's strong (25.7%) median wage growth over 1979 to 2018 may be related to marked occupational shifts over that period. In particular, middle-wage women moved from clerical and production jobs to higher-paying executive and managerial jobs, and to professional and technical occupations. Likewise, wage loss among Hispanic workers (who experienced a 4.6% decline at the median) occurred alongside gains in educational attainment and an 18 percentage point decline in production employment that was offset by gains in other occupation groups, particularly service jobs.

High-Wage Workers

Although wage patterns varied across demographic groups for low-wage and middle-wage workers, wages grew in real terms at the 90th percentile for all groups over the 1979-2018 period. Education gains and heightened concentration of employment in executive and professional occupations appear to help explain strong wage growth. The strong performance of high-wage workers (i.e., at the 90th percentile of wages) suggests that labor market demand for skilled workers increased over the 1979 to 2018 period, or that this group otherwise improved its bargaining position over compensation.[26] High-wage workers increased their educational attainment dramatically between 1979 and 2018, and—with the exception of Hispanic workers—were predominantly college degree holders in 2018. This finding for Hispanic workers should be put in the context of noteworthy compositional changes for this group. In particular, Pew Research Center reports that Hispanics are an increasingly diverse population, which may affect cross-time comparisons (i.e., differences in Hispanic worker characteristics in 2018 and 1979 may be greater than those for other worker groups).[27] Over the same period, high-wage workers became concentrated in executive, administrative, and managerial jobs and professional, technical, and related jobs, such that by 2018 these occupations represented more than 50% of employment in each group (more than 80% of employment when Hispanic workers are excluded from analysis).

[26] Another interpretation is that the bargaining position of certain highly paid workers (e.g., CEOs) improved. A broader discussion of factors influencing wage patterns at the top of the earnings distribution is in CRS Report R44705, *The U.S. Income Distribution: Trends and Issues*, by Sarah A. Donovan, Marc Labonte, and Joseph Dalaker.

[27] Antonio Flores, *How the U.S. Hispanic population is changing*, Pew Research Center, September 18, 2017, http://www.pewresearch.org/fact-tank/2017/09/18/how-the-u-s-hispanic-population-is-changing/.

Table 4. Low-Wage Workers' Educational Attainment and Occupation, by Selected Demographics, 1979 and 2018

	Overall		Male		Female		Black (Non-Hispanic)		White (Non-Hispanic)		Hispanic		Non-Hispanic	
	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018
Education														
High School Diploma or Less	80%	53%	73%	58%	85%	52%	91%	55%	77%	42%	92%	75%	79%	46%
Some College	13%	30%	14%	27%	11%	32%	7%	36%	14%	36%	7%	18%	14%	35%
Bachelor's Degree and Higher	7%	16%	12%	15%	4%	16%	2%	8%	9%	22%	1%	7%	8%	20%
Occupation														
Executive, Administrative, and Managerial	4%	4%	8%	4%	2%	4%	1%	3%	6%	6%	1%	3%	4%	5%
Professional, Technical, and Related	7%	10%	8%	8%	6%	12%	4%	9%	9%	15%	3%	5%	7%	13%
Sales	13%	13%	6%	10%	19%	15%	5%	11%	13%	14%	10%	9%	13%	13%
Administrative Support, Including Clerical	20%	15%	7%	10%	15%	15%	6%	12%	27%	19%	7%	7%	22%	16%
Service	28%	33%	19%	26%	36%	41%	51%	45%	21%	25%	32%	46%	28%	31%
Construction and Extraction	2%	4%	8%	10%	NA	NA	4%	2%	1%	3%	4%	7%	2%	2%
Installation, Maintenance, and Repair	1%	2%	7%	5%	NA	NA	1%	1%	NA	2%	2%	3%	1%	2%
Production	18%	9%	20%	12%	19%	7%	19%	8%	17%	8%	32%	10%	16%	8%
Transportation and Material Moving	6%	10%	16%	16%	3%	5%	10%	10%	6%	8%	8%	10%	6%	9%

Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018.

Notes: "Low-wage workers" refers to workers at the 5th-15th percentiles of their respective wage distribution. "NA" indicates an estimated percentage of less than 1%.

Table 5. Middle-Wage Workers' Educational Attainment and Occupation, by Selected Demographics, 1979 and 2018

	Overall		Male		Female		Black (Non-Hispanic)		White (Non-Hispanic)		Hispanic		Non-Hispanic	
	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018
Education														
High School Diploma or Less	60%	27%	60%	33%	68%	22%	70%	35%	55%	22%	79%	58%	59%	22%
Some College	19%	32%	21%	32%	20%	33%	19%	36%	20%	29%	14%	27%	20%	31%
Bachelor's Degree and Higher	21%	41%	20%	35%	13%	45%	11%	29%	25%	48%	7%	15%	21%	47%
Occupation														
Executive, Administrative, and Managerial	11%	16%	13%	15%	7%	16%	4%	9%	13%	19%	5%	7%	11%	17%
Professional, Technical, and Related	20%	28%	15%	22%	15%	33%	14%	20%	24%	33%	8%	11%	21%	32%
Sales	5%	7%	5%	8%	5%	8%	3%	7%	5%	8%	4%	7%	5%	7%
Administrative Support, Including Clerical	20%	15%	8%	7%	45%	27%	22%	21%	19%	13%	15%	18%	19%	14%
Service	7%	8%	6%	8%	10%	9%	19%	17%	6%	6%	13%	18%	6%	7%
Construction and Extraction	5%	6%	6%	11%	NA	NA	5%	3%	4%	5%	10%	15%	5%	5%
Installation, Maintenance, and Repair	5%	5%	9%	8%	NA	NA	2%	3%	5%	5%	4%	4%	6%	5%
Production	19%	9%	26%	10%	15%	5%	20%	8%	17%	6%	29%	11%	19%	8%
Transportation and Material Moving	8%	7%	11%	10%	2%	2%	11%	11%	6%	5%	12%	9%	8%	6%

Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018.

Notes: "Middle-wage workers" refers to workers at the 45th-55th percentiles of their respective wage distribution. "NA" indicates an estimated percentage of less than 1%.

Table 6. High-Wage Workers' Educational Attainment and Occupation, by Selected Demographics, 1979 and 2018

	Overall		Male		Female		Black (Non-Hispanic)		White (Non-Hispanic)		Hispanic		Non-Hispanic	
	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018	1979	2018
Education														
High School Diploma or Less	40%	6%	35%	7%	39%	4%	52%	8%	40%	6%	60%	25%	39%	5%
Some College	20%	13%	19%	13%	22%	12%	22%	22%	20%	13%	22%	35%	20%	12%
Bachelor's Degree and Higher	40%	81%	46%	80%	38%	84%	26%	70%	40%	82%	18%	39%	41%	83%
Occupation														
Executive, Administrative, and Managerial	23%	33%	27%	34%	13%	33%	10%	28%	24%	36%	12%	20%	23%	34%
Professional, Technical, and Related	28%	48%	28%	44%	40%	54%	20%	45%	27%	44%	14%	31%	28%	48%
Sales	5%	7%	7%	7%	6%	5%	2%	4%	6%	8%	3%	6%	5%	7%
Administrative Support, Including Clerical	7%	3%	5%	2%	29%	5%	14%	6%	7%	3%	12%	7%	7%	3%
Service	2%	3%	2%	3%	3%	2%	6%	5%	2%	3%	6%	7%	2%	3%
Construction and Extraction	12%	3%	12%	3%	NA	NA	7%	2%	12%	2%	14%	10%	12%	2%
Installation, Maintenance, and Repair	6%	1%	4%	1%	NA	NA	7%	4%	5%	1%	8%	7%	5%	1%
Production	12%	1%	11%	2%	7%	NA	20%	2%	12%	1%	22%	6%	12%	1%
Transportation and Material Moving	6%	1%	4%	2%	2%	NA	14%	5%	5%	1%	7%	7%	6%	1%

Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979-2018.

Notes: "High-wage workers" refers to workers at the 85th-95th percentiles of their respective wage distribution. "NA" indicates an estimated percentage of less than 1%.

Factors Affecting Wage Trends

This section briefly describes some of the major factors believed to affect wage trends. A full discussion of these factors, and the empirical evidence associated with different causal factors, is beyond the scope of this report. Rather, several of the primary mechanisms that are thought to contribute to wage growth or stagnation are outlined. In many cases, individual wages are likely determined by the interaction of several forces, such as workers' skills and their value to employers, job match quality, and relative bargaining power. Broadly speaking, these factors can be grouped into two categories: market factors (affecting the supply of and demand for workers) and institutional factors (affecting rules governing compensation). Over time, changes in these factors for various groups (e.g., in education and training investment, employers' demand for workers with certain skills, and institutions that govern wage bargaining), along with macroeconomic growth, play a role in shaping the wage gains or losses for those groups.

Market Factors

Workers come to labor markets—often local labor markets—with varying levels of human capital—collections of skills and experience, abilities, and other job-relevant attributes –where they match with employers seeking to hire certain types of workers. Some jobs require specialized skills and training (e.g., medical practitioners, skilled crafts like carpentry), whereas others can be performed by most workers of any skill level. For example, most workers could operate a cash register or perform simple building maintenance tasks with cursory on-the-job training. Employers are generally willing to pay more to skilled workers for two reasons. First, skilled workers come to the job with the required human capital to be productive and thus are well-positioned to help generate higher revenues for the firm. Second, because skilled workers are relatively scarce, employers offer higher wages to attract them away from other firms. To the extent that workers' skill sets become more valuable to employers over time or more scarce, wages should rise, and vice versa.

Technological change, international trade, immigration and other factors affecting labor supply changes, along with the quality of job matches are among the key market factors thought to contribute to recent wage trends. These forces briefly described here; a more detailed discussion is in CRS Report R44705, *The U.S. Income Distribution: Trends and Issues*, by Sarah A. Donovan, Marc Labonte, and Joseph Dalaker.

Technological change can affect wage patterns by changing employers' demand for certain groups of workers.[28] Where new technology raises workers' productivity (often for high-skilled workers)—and their value to employers—demand will rise, and put upward pressure on wages. At the same time, technological progress has reduced demand where workers' effort can be replaced by automation or information technology.[29] Technological improvements can further affect employers' demand for certain workers by increasing the feasibility of offshoring (i.e.,

[28] For an overview, see Daron Acemoglu and David H. Autor, "Skills, Tasks and Technologies: Implications for Employment and Earnings," in *Handbook of Labor Economics*, eds. Orley Ashenfelter and David Card, vol. 4B (Elsevier, 2011), pp. 1043-1171.

[29] For example, the availability of affordable desktop computers, word processing software, voicemail, and email eliminated many tasks traditionally performed by certain clerical staff (e.g., typists, secretaries), and increased automation in manufacturing plants reduced the demand for certain production workers.

moving production outside the United States) certain production tasks and services that do not need to be performed in proximity to the consumer (e.g., book-keeping, call-center activities).

Recent global trading patterns have altered what goods and services the United States produces, and thereby the demand for labor to carry out that production. For example, the long-term decline in U.S. manufacturing employment, which lasted through the end of the Great Recession, has led a number of researchers to investigate the extent to which the decline is caused by increased import penetration in manufacturing, which can easily be traded. Recent studies focus on the impacts of China's establishment (starting in 2000) as a global supplier of manufactured goods.[30] Increased international competition—and particularly from China—is among factors that contributed to factory closings and production shifts that displaced large numbers of U.S. workers. It had additional employment consequences for firms that provided inputs and support services to the manufacturing sector (e.g., suppliers of raw materials, delivery services, warehousing), and affected economic conditions in surrounding communities.

Changes to labor supply over time will also influence wages, at least in the short term. Public attention often centers on the supply effect of immigration, but other economic changes can shift the supply of labor as well. For example, social and economic change dramatically increased women's labor supply in the latter half of the last century. In addition, other policy mechanisms, such as changes in income tax rates or changes affecting the payoff to labor (e.g., the Earned Income Tax Credit) can influence the labor supply of targeted groups of workers. The labor market effects of immigration comprise a large and complex area of economic research.[31] Economic theory produces a range of possible outcomes that depend on the characteristics of incoming immigrant workers and how they compare to a country's existing pool of labor, the degree to which new immigrants and existing workers compete for jobs in the same labor markets, how employers respond to the new labor supply, macroeconomic considerations, and other factors. That said, a large influx of a particular worker group (e.g., low skilled workers) translates into an increase in labor supply, and could lower wage offers in the short run.

The quality of a job match (i.e., the suitability of a particular worker to a particular job) matters to wages as well. Job search is costly for both workers and employers, and sometimes workers accept less-than-optimal jobs (or employers make job offers to suboptimal candidates) to minimize search costs. Factors affecting job match quality include workers' information about job openings (e.g., the existence of vacancies, job attributes and how they align with worker preferences), employers' ability to locate jobseekers and accurately assess worker qualifications,

[30] These include Daron Acemoglu, David Autor, and David Dorn, Gordan H. Hanson, and Brendan Price, "Import Competition and the Great US Employment Sag of the 2000s," *Journal of Labor Economics*, vol. 34, no. 1 (Part 2 2016), pp. S141-S198; and Justin R. Pierce and Peter K. Schott, "The Surprisingly Swift Decline of U.S. Manufacturing Employment," *American Economic Review*, vol. 106, no. 7 (July 2016), pp. 1632-1662; and David H. Autor, David Dorn, and Gordon H. Hanson, *The China Shock: Learning from Labor Market Adjustment to Large Changes in Trade*, National Bureau of Economic Research, 21906, January 2016, http://www.nber.org/papers/w21906. The results of these studies should be considered with a few caveats in mind. For one, these studies focus on gross employment changes in the manufacturing sector; they do not account for potential employment gains in other sectors (e.g., U.S. export sectors and related sectors like transportation and warehousing). Also the proliferation of complex international supply chains increasingly blurs line between foreign and domestic outputs and complicates empirical analyses such as these. Finally, these studies do not account for the potential positive impact lower-priced imports can have on the real incomes of a broad range of consumers in the economy.

[31] A detailed discussion of what economic theory predicts about the labor market impacts of immigration for the United States, and a review of the empirical literature is in National Academies of Sciences, Engineering, and Medicine, *The Economic and Fiscal Consequences of Immigration*, ed. Francine D. Blau and Christopher Mackie (Washington, DC: The National Academies Press, 2016); see also CRS Report R42988, *U.S. Immigration Policy: Chart Book of Key Trends*, by William A. Kandel.

and geographic mobility. Better job matches increase workers' value, and to the extent that workers can bargain effectively for a portion of that improvement, wages rise.

Institutional Factors

Labor market institutions are the set of formal and informal rules that govern compensation, and include the minimum wage, the strength and structure of labor unions, and employment practices that affect workers' ability to bargain over compensation. Changes to institutions over time can therefore affect wage trends as well.

Minimum wages may affect wage growth through two primary channels. First, and most directly, minimum wages set a floor for low-wage workers. Second, to the extent that employers maintain wage differentials between the lowest-wage workers and those higher in the wage distribution, minimum wage increases may affect both minimum wage workers and those with earnings above those levels. Minimum wage earners may see declines in real wages to the extent that the minimum wage is not increased, or increases do not keep pace with inflation. The federal minimum wage, for example, was not increased from 1981 through 1989, thus falling in real value for nearly a decade. Recent evidence suggests that the decline in the real value of the federal minimum wage in the 1980s played a moderate role in increasing the wage gap between low and middle earners.[32]

Changes in unionization, employment policies, and workplace organization can affect workers' relative bargaining power and influence wage growth. For example, the evidence of a "union wage premium" suggests that, other factors being equal, union members have higher wages compared to nonunion members. Empirical evidence indicates that the private-sector union wage premium is in the 10%-20% range.[33] However, over time these gains apply to a shrinking pool of workers, as the union membership rate declined from 20.1% in 1983 to 10.7% in 2018, with much of that decline in the private sector. As such, empirical work in this area has suggested that the decline in unionization contributed to stagnating wages and rising inequality, particularly in the 1980s.[34] These effects are particularly meaningful for middle-wage workers and for men, because traditionally male "blue collar" jobs, such as manufacturing and construction, had higher unionization rates.

The use of employment policies to restrict firms' competition for workers may affect wages by limiting workers' relative bargaining power. Many workers achieve wage gains by changing jobs. The gains associated with job mobility (i.e., movement between jobs) are therefore restricted, plausibly, where franchise agreements include provisions that prohibit employers from hiring workers from other firms affiliated with the same franchisor (i.e., no-poach or no-hire provisions) or where employment contracts include provisions restricting workers from accepting job offers from firms in the same industry (i.e., noncompete clauses). A recent study of no-poach provisions in franchise contracts found that 58% contained some restriction on franchisees' ability to recruit and hire workers from other firms within the franchise system.[35]

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[32] David H. Autor, Alan Manning, and Christopher L. Smith, "The Contribution of the Minimum Wage to US Wage Inequality over Three Decades: A Reassessment," *American Economic Journal: Applied Economics*, vol. 8, no. 1 (January 2016), pp. 58-99.

[33] See, for example, Fernando Rios-Avila and Barry T. Hirsch, "Unions, Wage Gaps, and Wage Dispersion: New Evidence from the Americas," *Industrial Relations*, vol. 53, no. 1 (January 2014), pp. 1-27.

[34] David Card, "The Effect of Unions on Wage Inequality in the U.S. Labor Market," *Industrial and Labor Relations Review*, vol. 54, no. 2 (January 2001), pp. 296-315.

[35] Alan B. Krueger and Orley Ashenfelter, *Theory and Evidence on Employer Collusion in the Franchise Sector*,

In addition, a movement toward greater use of contractors and subcontractors in some industries has, by some accounts, reduced the bargaining power of certain worker groups (e.g., lower-paid workers in service occupations) and put downward pressure on their wages.[36] For example, many companies that traditionally employed their own janitorial staff now obtain cleaning and maintenance services through a separate vendor. Although such restructuring can be beneficial in terms of efficiency gains, this workplace movement also disassociates workers from the general pay schedule of the industry and from large firms more specifically. Such workplace models (e.g., service contractors not part of the core business for which they are providing services) operate in highly competitive markets, which puts pressure on employers to keep operating costs (including labor costs) low, and poses greater challenges for union organizing.

At the same time, changes in pay-setting practices in certain high-pay occupations, the emergence of superstar earners (e.g., in sports and entertainment), and other factors may have improved wage growth for some workers at the top of the wage distribution.[37]

Macroeconomic Factors

In general, aggregate employment increases with economic growth. This occurs because as innovations bring new and better products to market, consumer demand for goods and services rises, and all things equal, so does employment.[38] Macroeconomic forces can also affect employment through changes on the production side (i.e., by changing the costs of producing goods and services). In the long run, labor productivity (i.e., output produced per hour of labor) and wages tend to move together, as lower production costs cause firms to expand production and increase their demand for labor. The degree to which greater demand for workers translates into growth in aggregate earnings (i.e., the sum of all workers' earnings across the workforce) and the distribution of those earnings among workers depends on variety of factors, including market and institutional factors discussed above, and overarching macroeconomic forces. A growing gap between labor productivity and compensation[39] and the related decline in labor's share of gross domestic income (GDI) from 57.2% of GDI in 1979 to 53.1% of GDI in 2017,[40] suggests a shift

Princeton University, Industrial Relations Section, Working Paper #614, Princeton, NJ, September 1, 2017, p. 7, http://dataspace.princeton.edu/jspui/bitstream/88435/dsp014f16c547g/3/614.pdf.

[36] David Weil, *The Fissured Workplace* (Cambridge, MA: Harvard University Press, 2014).

[37] For example, studies have questioned whether the close relationship at some corporations between chief executive officers (CEOs) and their boards (which set their pay) creates "principal-agent" problems that have allowed CEOs undue influence over setting their own pay. These arguments are evaluated in CRS Report RL33935, *The Economics of Corporate Executive Pay*, by Gary Shorter and Marc Labonte.

[38] Private sector consumption is an important component of gross domestic product (GDP). U.S. Bureau of Economic Analysis data indicate that personal consumption expenditures have made up at least 60% of GDP since 1979, and its share of GDP increased between 1979 and 2018. The share has varied around 68% since 2009. U.S. Bureau of Economic Analysis, *Shares of Gross Domestic Product: Personal Consumption Expenditures*, retrieved from Federal Reserve Economic Database, Series DPCERE1A156NBEA, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/.

[39] B. Ravikumar and Lin Shao, *Labor Compensation and Labor Productivity: Recent Recoveries and the Long-Term Trend*, Federal Reserve Bank of St. Louis, Economic Synopses, No. 16, August 12, 2016, https://research.stlouisfed.org/publications/economic-synopses/2016/08/12/labor-compensation-and-labor-productivity-recent-recoveries-and-the-long-term-trend/.

[40] GDI measures overall economic activity by the incomes generated from producing gross domestic product (GDP), which is a measure of final expenditures.

in these forces such that national income growth translates into lower growth in aggregate earnings than in the past.[41]

Similarly in times of economic recession, private sector demand for goods and services declines, putting strain on the labor market. Employment levels fall and high unemployment rates (together with declining revenues) put downward pressure on overall wage growth. Countervailing that pressure is a tendency of employers to retain their most productive workers, which affects both the composition of the workforce (i.e., who remains after layoffs) and creates an incentive for workers to increase effort and productivity to avoid a layoff.[42] Macroeconomists also observe that middle-skill workers experience relatively higher job loss during recession, which may further contribute to differential wage growth because displaced workers tend to reenter the labor market at lower wage levels and may increase competition for other jobs held by middle- and lower-skilled workers. Although difficult to observe in aggregate wage statistics, research based on microeconomic data indicates wages tend to fall during recessions and rise during recoveries (i.e., wages are procyclical), although the wage response appears to vary from recession to recession.[43]

[41] There are many views on what drives the decline in labor's share of income. The results of a BLS analysis suggests that technological change is an important driver; notably BLS finds that the decline in labor's share of income is pronounced in information-technology industries (e.g., software publishers and wireless telecommunications carriers); others have emphasized the role of increased global integration, including trade in final and intermediate goods, and declines in the labor's bargaining power over compensation. Michael Brill, Corey Holman, Chris Morris, Ronjoy Raichoudhary, and Noah Yosif, *Understanding the labor productivity and compensation gap*, Bureau of Labor Statistics, Beyond the Numbers: Productivity, vol. 6, no. 6, June 2017, https://www.bls.gov/opub/btn/volume-6/understanding-the-labor-productivity-and-compensation-gap.htm. Data on labor's share of gross domestic income in 1979 and 2017 are from Federal Reserve Economic Database, *Shares of gross domestic income: Compensation of employees, paid, Percent, Annual, Not Seasonally Adjusted*, Federal Reserve Bank of St. Louis, Series A4002E1A156NBEA, http://fred.stlouisfed.org. Compensation data do not include labor income paid to small business owners.

[42] Edward P. Lazear, Kathryn L. Shaw, and Christopher Stanton, "Making Do With Less: Working Harder during Recessions," *Journal of Labor Economics*, vol. 34, no. S1 (January 2016), pp. 333-360.

[43] Michael W. L. Elsby, Donggyun Shin, Gary Solon, "Wage Adjustment in the Great Recession and Other Downturns: Evidence from the United States and Great Britain," *Journal of Labor Economics*, vol. 34, no. S1 (January 2016), pp. 246-291.

Appendix A. Data Used in this Report

The data used to create annual hourly wage distributions over the 1979-2018 period are from the Current Population Survey (CPS) Outgoing Rotation Groups (ORGs). The CPS is a large-scale household survey conducted monthly by the Census Bureau. CPS participants are interviewed for four consecutive months, then leave the survey for eight months, when they reenter the survey for a final four months. The ORGs are made up of respondents completing their fourth month in the survey (i.e., before they go out on an eight-month hiatus) and those completing their eighth and final interview. Unlike other groups, the ORGs are asked about their usual earnings and hours worked, making them a particularly useful sample for hourly wage studies.

This report's sample comprises individuals 25 to 64 years old who were employed in nonfarm, nonmilitary wage and salary jobs during the survey week and reported enough information to compute an hourly wage. Excluded from the sample are self-employed workers, Armed Forces members, workers in agricultural occupations, and workers whose wages were imputed by the Census Bureau. As others have done, CRS excluded Census-imputed wages due to the finding by Hirsch and Schumacher (2002) that a large portion of them were imputed with error.[44]

CRS estimates hourly wages by dividing workers' reported usual weekly earnings by their usual weekly hours of work. For workers who report they are paid by the hour, their reported hourly rate of pay were used. Wages represent earnings before deductions. For workers who are *not* paid by the hour (*non-hourly workers*), wages include tips, overtime pay, and commissions. Unfortunately, this information on overtime, tips, and commissions is not collected for hourly workers before 1994 and is therefore not included here in hourly wage estimates for them.[45] Wages are weighted by the product of a worker's CPS weight and their weekly hours (i.e., wages are hours-weighted).

CPS earnings data are "top-coded"—that is, any reported earnings above a given top-code value are replaced with the top-code value—to reduce the likelihood that any particular survey respondent can be identified in the data. In 1979, the first year of data, weekly earnings are top-coded at $999 per week. The top-code changes twice over the 1979-2018 period: it was raised to $1,923 per week in 1989 and to $2,884.61 per week in 1998. Although necessary to maintain the anonymity of survey respondents, top-coding is problematic to studies that attempt to characterize the wage distribution on a year-by-year basis, because the wage distribution is not observable above the top-code value, and the top-code value changes over time. Researchers have addressed top-coded values using a variety of methods. CRS follows the Center for Economic and Policy Research's method by modeling earnings as having a log-normal distribution and replacing top-coded values with gender-specific estimates of the mean value of weekly earnings above the top-code value.[46]

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[44] Barry Hirsch and Edward Schumacher, "Match Bias in Wage Gap Estimates Due to Earnings Imputation," *Journal of Labor Economics*, vol. 22, no. 3 (2002), pp. 689-722.

[45] It is possible to estimate overtime, tips, and commission for hourly workers after 1994. However, doing so would create an inconsistent series and interfere with the attempt to describe trends over the full 1979-2018 period. To the extent that the compensation structure (i.e., the relative contribution of base wages plus overtime, tips, and commissions) has changed over time for hourly workers, the reported wages for hourly workers could understate or overstate wage trends.

[46] As a sensitivity check, wage trends are also estimated using methods applied by Autor, Manning, and Smith (2016), and did not find notably different trends. David H. Autor, Alan Manning, and Christopher L. Smith, "The Contribution of the Minimum Wage to US Wage Inequality over Three Decades: A Reassessment," *American Economic Journal: Applied Economics*, vol. 8, no. 1 (January 2016), pp. 58-99. Data and statistical codes used in this paper are at http://economics.mit.edu/faculty/dautor/data/ams_aej_15.

Following standard practice, wage outliers (i.e., implausibly low or high wage reports) were addressed by excluding wages that are less than $0.50 in 1989 dollars and greater than $150 in 1989 dollars. Hourly wages were converted to 2018 dollars using the Consumer Price Index for All Urban Consumers, U.S. City Average (CPI-U). The CPI-U, which is a measure of the average change over time in prices paid by consumers for a market basket of goods and services, is commonly used to compare the real (inflation-adjusted) value of earnings or spending data at different points in time. The CPI-U, for example, is the most common index used to adjust state minimum wage rates.

Appendix B. Demographic and Occupational Composition of the Wage Distribution in 1979 and 2018

This report has looked at wage trends by demographic group and earner category, and worker characteristics within those groups. For example, the median wage for women in a given year is defined with respect to the distribution of *women's* wages (not the overall wage distribution). **Table B-1** explores the interaction between demographic groups and earnings from a different perspective. It describes the composition of the workforce overall and within the bottom, middle, and top third of the overall wage distribution.

Overall, the workforce was more diverse in 2018 than it was in 1979 (i.e., the share of white workers and non-Hispanic workers decreased), and the sex composition more balanced. In 2018, workers were older and better educated (i.e., a higher share of workers with at least a bachelor's degree). The share of workers in production jobs fell sharply between 1979 and 2018 (with losses in other job categories as well, such as administrative support and clerical work), with gains in employment share in many categories—the largest gains being in professional, technical, and related occupations.

These compositional changes did not all occur, however, to the same degree in each third of the overall wage distribution. For example, black workers remained overrepresented in the bottom 66% (i.e., bottom third and middle third) of the distribution; the share of black workers in the top third of wage earners rose by 1 percentage point between 1979 and 2018. Similarly, although female workers and Hispanic workers gained shares in the upper wage tercile (i.e., top third), they remained underrepresented among top earners in 2018.

In terms of shifting occupational composition, from 1979 to 2018

- in the bottom third of the wage distribution, the share of workers in production work declined by 9 percentage points and in administrative support and clerical jobs by 7 percentage points. Over the same period, workers in the bottom third became more concentrated in service-sector employment (24% to 29%).
- in the middle wage tercile, the share of workers in production work declined by 11 percentage points and in administrative support work by 5 percentage points. On the other hand, workers in this tercile increased their share of employment by 9 percentage points in professional, technical, and related jobs, and by 5 percentage points in executive, administrative, and managerial occupations.
- in the top third of the wage distribution, the share of workers in executive, administrative, and managerial occupations and professional, technical, and related jobs increased from 44% in 1979 to 74% in 2018.

Table B-1. Worker Characteristics by Wage Tercile, 1979 and 2018

	Overall		Bottom Third		Middle Third		Top Third	
	1979	2018	1979	2018	1979	2018	1979	2018
Race								
White[a]	87%	79%	83%	74%	88%	82%	92%	81%
Black	10%	11%	14%	16%	10%	10%	6%	7%
Other	2%	10%	3%	10%	2%	8%	2%	12%
Hispanic Ethnicity								
Non-Hispanic	95%	86%	93%	78%	95%	87%	97%	94%
Hispanic	5%	14%	7%	22%	5%	13%	3%	6%
Sex								
Male	56%	51%	30%	43%	59%	53%	83%	60%
Female	44%	49%	70%	57%	41%	47%	17%	40%
Age								
25-34 years	40%	30%	40%	37%	45%	31%	34%	21%
35-44 years	25%	26%	24%	24%	24%	26%	29%	29%
45-54 years	21%	25%	21%	21%	19%	24%	23%	29%
55-64 years	14%	19%	16%	18%	13%	19%	13%	21%
Education								
High School Diploma or Less	61%	30%	77%	49%	60%	28%	45%	10%
Some College	18%	27%	14%	32%	20%	31%	20%	18%
Bachelor's Degree and Higher	21%	43%	9%	20%	20%	41%	35%	72%
Occupation								
Executive, Administrative, and Managerial	12%	17%	5%	6%	11%	16%	20%	31%
Professional, Technical, and Related	17%	27%	9%	13%	19%	28%	24%	43%
Sales	7%	8%	9%	11%	5%	7%	5%	7%
Administrative Support, Including Clerical	18%	12%	23%	16%	20%	15%	10%	5%
Service	12%	14%	24%	29%	7%	9%	3%	4%
Construction and Extraction	5%	5%	2%	5%	5%	6%	8%	4%
Installation, Maintenance, and Repair	5%	3%	2%	3%	6%	4%	7%	3%
Production	18%	7%	18%	9%	19%	8%	15%	3%
Transportation and Material Moving	7%	6%	7%	9%	8%	6%	7%	2%

Source: CRS estimates using Current Population Survey Outgoing Rotation Group data for 1979 and 2018.

Notes: Sample comprises nonfarm wage and salary workers who are 25-64 years old and provide sufficient information to compute an hourly wage. Dollar amounts are adjusted for inflation using the CPI-U.

a. Race is described irrespective of Hispanic ethnicity. The share of the overall population of workers that was white and non-Hispanic in 1979 was 80% and black non-Hispanic was 10%; these shares were 64% and 10% in 2018.

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