

# Education and the Evolution of Earnings Across Population Groups Since 2000

by Kelley Sarussi and Thomas Walstrum

## Introduction

By nearly all macroeconomic measures, the US economy is in good shape: unemployment is low, jobs growth is steady, inflation is stable, and GDP has expanded uninterrupted for 10 years—the longest expansion in US history. The good news from the aggregate data means that most people are in the best economic position they have been in for some time. But by definition, aggregate data cannot tell us whether an overall good economy is benefitting some population groups more than others. This article disaggregates the good news in the macrodata by tracking the fortunes of a variety of population groups since 2000.

We focus in this article on earnings per capita, a broad measure of economic well-being that can be decomposed into four additional commonly used labor market measures: earnings per hour, hours per worker, the employment rate (100 minus the unemployment rate), and the labor force participation rate. For each of these measures, we calculate trends for different age, sex, race, and education groups since 2000, another time when the macroeconomy was doing well. The combination of five measures of economic well-being with four population group categories offers a nuanced perspective on what has changed since 2000, and for whom. We come away with two main findings, both related to education levels: first, while the Great Recession affected all population groups, it was particularly difficult for groups with lower educational attainment. Second, since 2000, earnings per capita has grown the most for women and minority groups, with rising education

levels playing an important role. We conclude by noting that while women and minority groups have achieved the most earnings growth since 2000, their earnings levels are still lower than those of their male and white counterparts.

Our data come from the March Current Population Survey (provided by IPUMS [2018]), which covers yearly earnings, work status, demographics, and education.<sup>1</sup> Throughout the article, we focus on people age 25 to 64, the period of life when most have completed their education and are available to work. For clarity, we convert our measures into indexes, where we set a measure's average from 2000 to 2003 equal to 100. Presenting the data in terms of an index makes it easy to see how much a measure has changed relative to the early 2000s. For example, an index value of 110 for earnings per capita means that it is 10 percent higher than its 2000-3 average. Formally, the index for a given measure for a given year is

$$Index_{Year} = 100 \cdot \frac{Measure_{Year}}{Measure_{2000-3}}$$

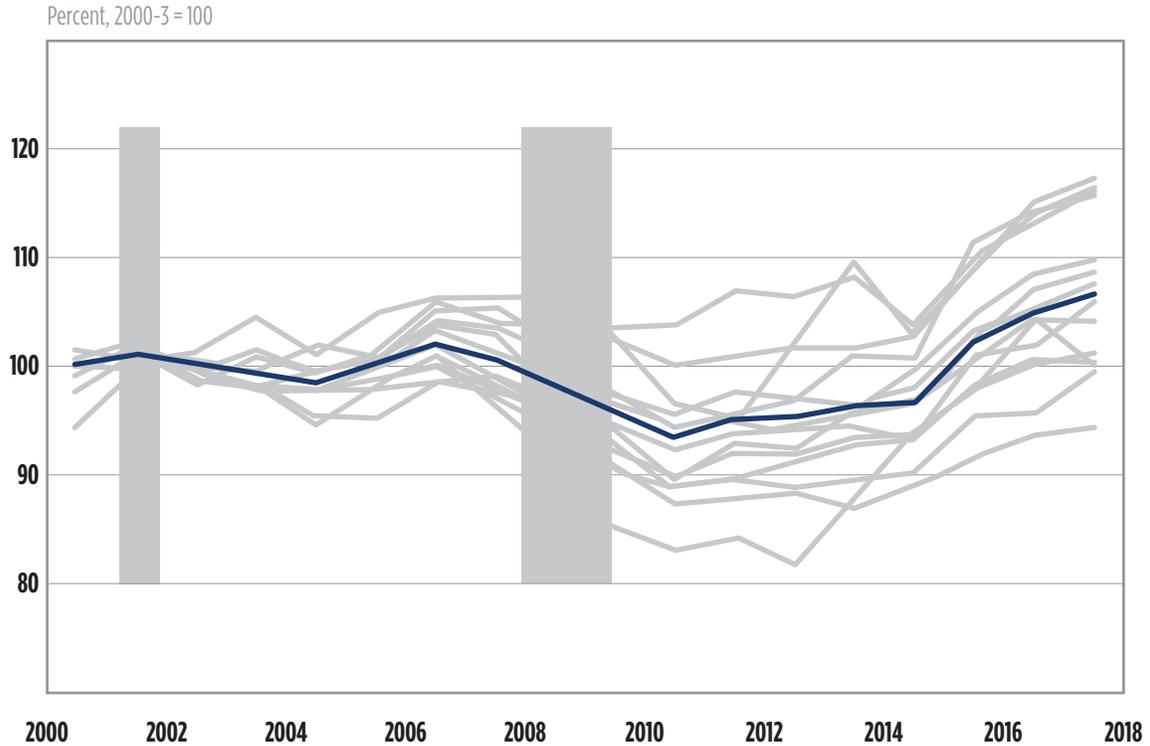
## The evolution of earnings per capita by population group

We first document how our primary measure, earnings per capita, has changed in the aggregate and across our various groups. Figure 1 shows aggregate earnings in blue and earnings for the different age, sex, race, and education groups in gray.<sup>2</sup> We provide numbers for specific groups later in the article in tables

1 and 2. The dispersion of the gray lines indicates that some groups have had very different economic experiences than others since the early 2000s. One group is below its 2000-3 level and an additional four have seen virtually no growth. By contrast, four groups are at least 15 percent above their 2000-

3 levels. In spite of the noticeable differences, every group experienced a decline in earnings during the Great Recession (the shaded region that starts in 2008) and growth in earnings from 2010 to 2017. To understand what's behind the different earnings experiences of our population groups, we decompose

**Figure 1. Index of real earnings per capita by population group**



Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Population groups are age group (25 to 34, 35 to 44, 45 to 54, 55 to 64), sex group, race and ethnicity group (black not Hispanic, white not Hispanic, other race not Hispanic, Hispanic), and education group (no high school diploma, high school diploma, some college, bachelor's degree and higher). All data are for people age 25 to 64. Earnings are adjusted for inflation using the PCE price index. Shaded regions denote a recession as determined by the NBER.

earnings per capita into four components: two that primarily capture short run changes and two that primarily capture long run changes. Macroeconomists often call short run measures that move between highs and lows every few years “cyclical” and long run measures that move between highs and lows across decades “structural.” While all four of the components of earnings per capita can experience cyclical and structural changes, it is clear in our data (and data for earlier periods as well) that each measure is dominated by one or the other. The cyclical measures we construct are hours per worker and the employment rate (equal to 100 minus the

unemployment rate)<sup>3</sup> and the structural measures are earnings per hour and the labor force participation rate. The formula for our decomposition is

$$\frac{Earnings}{Population} = \frac{Earnings}{Hour} \cdot \frac{Hours}{Worker} \cdot \frac{Workers}{Labor Force} \cdot \frac{Labor Force}{Population}$$

where the first component is earnings per hour, the second is hours per worker, the third is the employment rate, and the fourth is the labor force participation rate.

For this article, it is useful to convert the decomposition into percentage change terms to align with the indexes we calculate, which are interpreted in percentage change terms. When we make this conversion, the sum of the percentage changes of the four components is approximately<sup>4</sup> equal to the percentage change in per capita earnings:

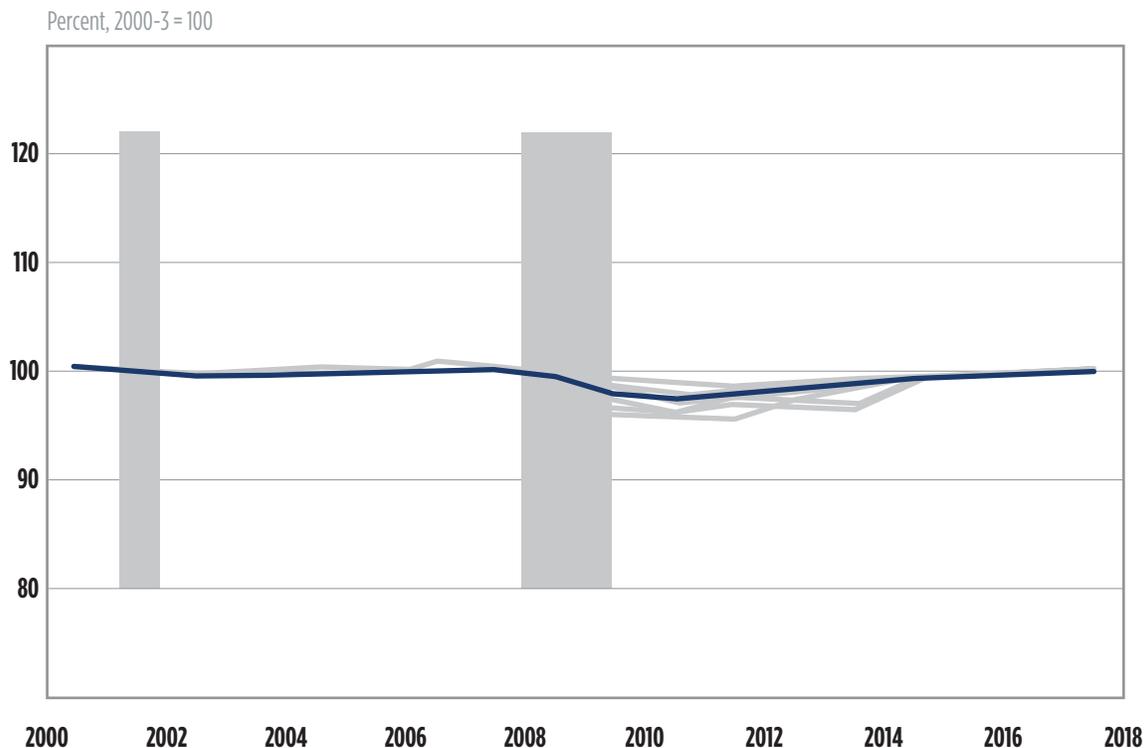
$$\% \Delta \frac{\text{Earnings}}{\text{Population}} \approx \% \Delta \frac{\text{Earnings}}{\text{Hour}} + \% \Delta \frac{\text{Hours}}{\text{Worker}} + \% \Delta \frac{\text{Workers}}{\text{Labor Force}} + \% \Delta \frac{\text{Labor Force}}{\text{Population}}$$

For example, if, for a given year, earnings per hour grew 1 percent, hours per worker grew 2 percent, the employment rate grew 3 percent, and the labor force participation rate grew 4 percent, earnings per capita will have grown by about 10 percent.

## The evolution of the cyclical components of earnings per capita

Let's now look at how our two cyclical measures, the employment rate and hours per worker, have changed since the early 2000s. Figure 2 shows indexes of the employment rate by population group. Compared with figure 1 (which has the same scale), the lines are quite close together, meaning most groups had similar experiences. The early 2000s recession was mild enough that the employment rate barely budged for any group. In contrast, the Great Recession affected the employment rate for every population group, and most did not return to their pre-recession employment rates until 2015.

**Figure 2. Index of the employment rate by population group**



Source: Authors' calculations using data from the Bureau of Labor Statistics.

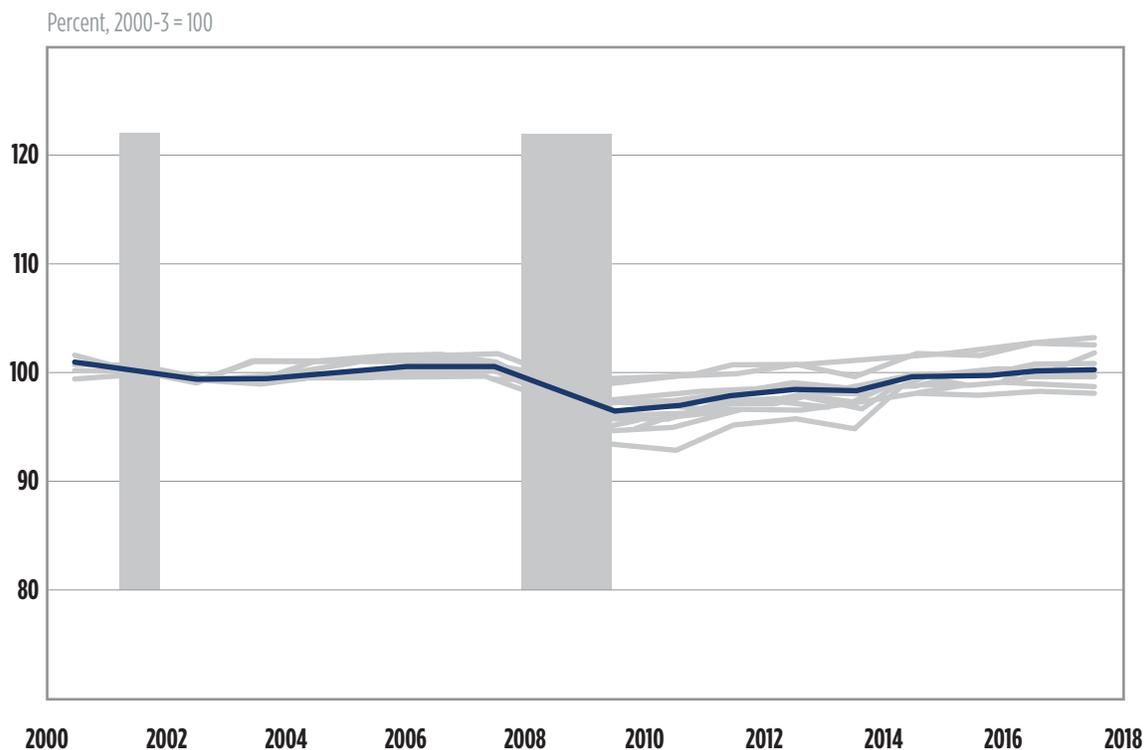
Notes: Population groups are age group (25 to 34, 35 to 44, 45 to 54, 55 to 64), sex group, race and ethnicity group (black not Hispanic, white not Hispanic, other race not Hispanic, Hispanic), and education group (dropout, high school diploma, some college, bachelor's degree and higher). All data are for people age 25 to 64. Shaded regions denote a recession as determined by the NBER.

Before moving on to hours per worker, it is important to note that there is a technical reason the employment rate didn't move as much as one might expect during the recessions. In our data, respondents provide answers in March about what happened during the prior year. To be counted as unemployed, a respondent has to have looked for a job at some point during the previous year, but never have held a job. This means that people who were unemployed for, say, six months during the prior year were counted as employed for that year because they were also employed for six months. What is different between those who worked part of a year

and those who worked a full year is the number of hours they worked. Because many unemployment spells last only a few months, a sizeable portion of the unemployment caused by recessions is reflected in the hours per worker measure.

Figure 3 shows indexes of hours per worker by population group, and it is clear that the measure is more responsive to the two recessions that occurred since 2000. In addition, there is more variation across groups: hours dropped more for some groups than for others during the Great Recession, and some groups appear to have a slight upward or downward trend in their hours (we discuss long run trends in the next section).

**Figure 3. Index of hours per worker by population group**



Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Population groups are age group (25 to 34, 35 to 44, 45 to 54, 55 to 64), sex group, race and ethnicity group (black not Hispanic, white not Hispanic, other race not Hispanic, Hispanic), and education group (dropout, high school diploma, some college, bachelor's degree and higher). All data are for people age 25 to 64. Shaded regions denote a recession as determined by the NBER.

Let's now look at individual groups. And to see how the business cycle affects them, we will focus on what happened during the Great Recession. Table 1 shows how earnings per capita and its components changed from the peak prior to the Great Recession in 2007 to the trough following it in 2010. Overall, earnings per capita fell by 7.0 percent, primarily because of a 2.5 percent decline in the employment rate and a 3.4 percent decrease in hours. The labor force participation rate also fell, but as we discuss later, the drop was in line with the long run decline that occurred from 2000 to 2017. Earnings per hour changed only a little. Among the different population groups, the Great Recession affected young people, blacks, Hispanics, and low education groups the most, with earnings per capita declines that were 30 percent to 90 percent

larger than the overall decline. This result has been documented before. And in a recent study, Hoynes, Miller, and Schaller (2012) find that a large share of the differences between demographic groups in their responses to a recession can be explained by the industries in which they work: minorities and lower-educated people tend to be employed in industries that are more responsive to the business cycle, such as construction and manufacturing. The exception to this finding is young people, who are more affected by recessions regardless of their industry affiliation. This suggests that, as Jefferson (2008) proposes, businesses (regardless of industry) tend to focus their employment reductions during downturns on workers with less education or experience.

**Table 1. Percent change in earnings per capita and its components from 2007 to 2010 by population group**

	Earnings per capita	Earnings per hour	<b>Hours per worker</b>	<b>Employment rate</b>	Labor force participation rate
Overall	-7.0	.6	<b>-3.4</b>	<b>-2.5</b>	-1.8
Age 25 to 34	-10.4	-1.9	<b>-4.1</b>	<b>-3.1</b>	-1.7
Age 35 to 44	-6.8	.5	<b>-3.6</b>	<b>-2.3</b>	-1.5
Age 45 to 54	-6.8	.2	<b>-3.1</b>	<b>-2.4</b>	-1.6
Age 55 to 64	-2.3	2.6	<b>-2.1</b>	<b>-2.3</b>	-.4
Female	-5.0	.8	<b>-1.9</b>	<b>-2.3</b>	-1.7
Male	-7.9	.9	<b>-4.4</b>	<b>-2.7</b>	-1.8
Black, not Hispanic	-12.8	-1.5	<b>-3.9</b>	<b>-4.4</b>	-3.7
Hispanic	-9	1.2	<b>-5.1</b>	<b>-3.3</b>	-2.0
White, not Hispanic	-5.4	.9	<b>-2.9</b>	<b>-2.0</b>	-1.4
Other race, not Hispanic	-7.3	-.7	<b>-3.1</b>	<b>-2.8</b>	-1.0
Bachelor's degree or higher	-5.0	-1.5	<b>-1.4</b>	<b>-1.2</b>	-1.0
Some college	-10.3	-1.6	<b>-4.0</b>	<b>-2.5</b>	-2.5
High school diploma	-10.3	-.2	<b>-4.7</b>	<b>-3.7</b>	-2.1
No high school diploma	-13.4	1.6	<b>-7.6</b>	<b>-4.4</b>	-3.4

Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Cyclical measures are in bold. Data are for people age 25 to 64. Earnings are adjusted for inflation using the PCE price index.

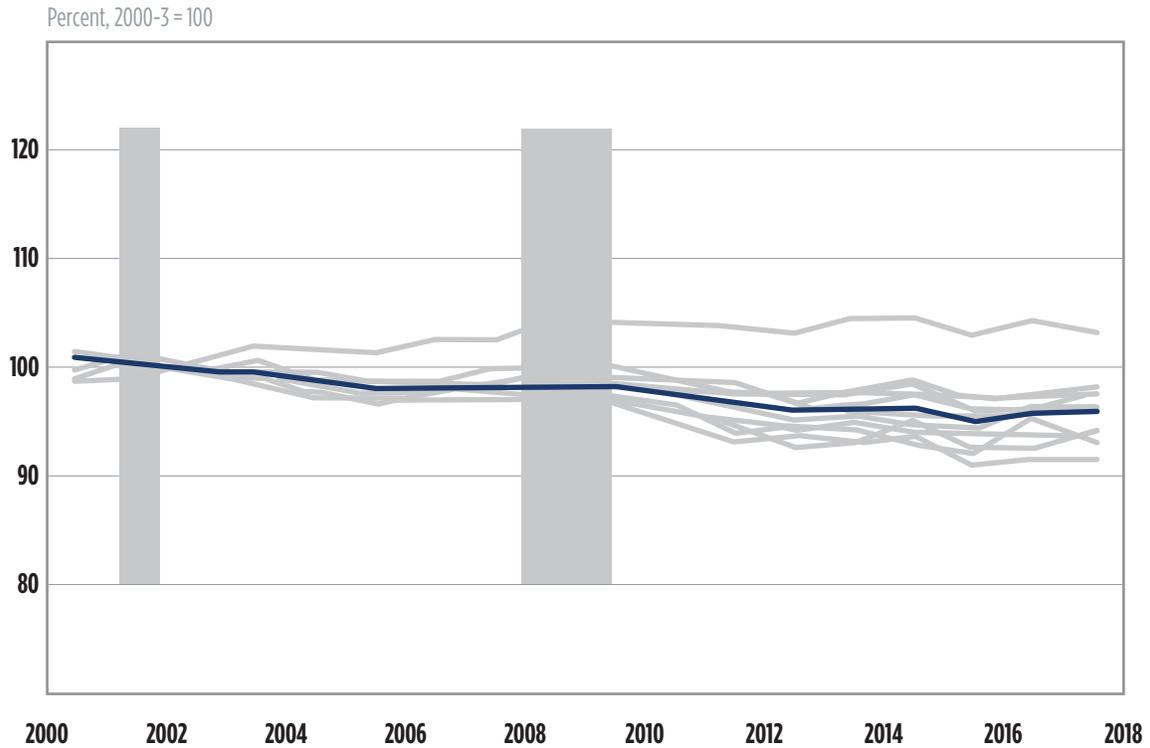
## The evolution of the structural components of earnings per capita

We now turn to how our two structural measures, the labor force participation rate and earnings per hour, have changed since 2000. Interestingly, the two measures moved in opposite directions. Figure 4 shows that labor force participation has declined for almost

every group and figure 5 shows that earnings per hour have increased for every group. However, there are noticeable differences between groups in the extent to which the measures have decreased or increased.

Table 2 summarizes for each population group what's shown in figures 1 through 5 by calculating the percentage change in our measures from their 2000-03 average to 2017. Overall earnings per capita

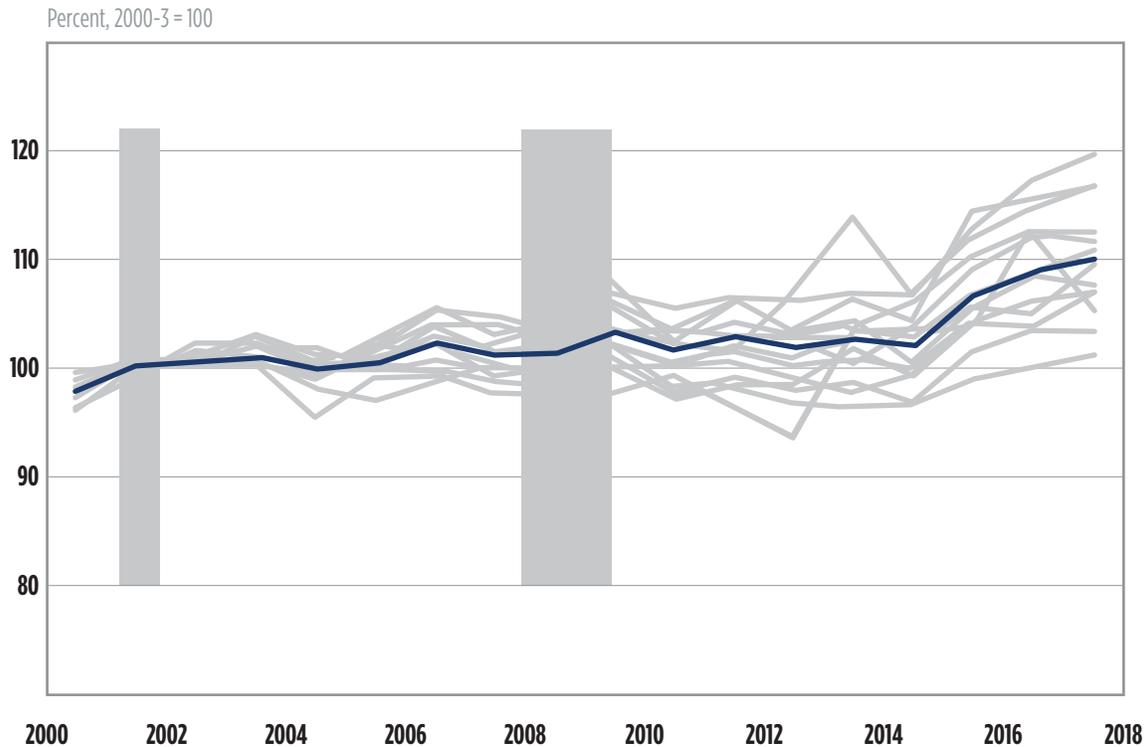
**Figure 4. Index of the labor force participation rate by population group**



Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Population groups are age group (25 to 34, 35 to 44, 45 to 54, 55 to 64), sex group, race and ethnicity group (black not Hispanic, white not Hispanic, other not Hispanic, Hispanic), and education group (dropout, high school diploma, some college, bachelor's degree and higher). All data are for people age 25 to 64. Shaded regions denote a recession as determined by the NBER.

**Figure 5. Index of real earnings per hour by population group**



Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Population groups are age group (25 to 34, 35 to 44, 45 to 54, 55 to 64), sex group, race and ethnicity group (black not Hispanic, white not Hispanic, other not Hispanic, Hispanic), and education group (dropout, high school diploma, some college, bachelor's degree and higher). All data are for people age 25 to 64. Shaded regions denote a recession as determined by the NBER.

grew 6.6 percent, as the labor force participation rate fell by 3.6 percent and earnings per hour grew 10.1 percent. The cyclical measures were little changed.

What is behind the falling labor force participation rate and rising earnings per hour? There is much research in economics on both topics. Let's first discuss the fall in labor force participation. A thorough discussion is beyond the scope of this article, but there are a few salient points that can be made. While the numbers in table 2 suggest otherwise, historically, it has been important to distinguish between male and female participation rates. Men's participation has been falling since the 1960s (primarily for less-educated men), while women's participation steadily rose throughout the 20th century and only started falling during the period we are examining. A number of theories have been put forth to explain these trends. One prominent theory for men is that demand for

middle-skilled, male-dominated occupations has been declining since the 1960s, particularly for occupations closely tied to manufacturing (Tüzemen [2018]). The story for women is more complicated, with rising education levels, rising demand for female-dominated occupations, and cultural changes all behind the increase in participation throughout the 20th century (Blau, Ferber, and Winkler [2006]).

Table 2 shows that since 2000, labor force participation has declined similarly for men, women, and most other groups as well, with just one exception, people age 55 to 64. The primary explanation in the economics literature for the shared decline among men and women is that both male- and female-dominated, middle-skilled occupations have experienced declines in demand since 2000. Abraham and Kearney (2018) find that increased globalization (especially due to rising Chinese exports) and increased automation

have played important roles in the decline. This explanation is in line with the pattern of participation that we see in table 2 across education groups: while participation for the bachelor's degree group has

decreased only slightly, participation for the other education groups has fallen much more.

**Table 2. Percent change in earnings per capita and its components from 2000-3 to 2017 by population group**

	Earnings per capita	<b>Earnings per hour</b>	Hours per worker	Employment rate	<b>Labor force participation rate</b>
Overall	6.6	<b>10.1</b>	.3	.1	<b>-3.6</b>
Age 25 to 34	6.1	<b>9.5</b>	.2	.1	<b>-3.3</b>
Age 35 to 44	9.8	<b>12.5</b>	.5	.1	<b>-2.9</b>
Age 45 to 54	4.1	<b>7.6</b>	.1	.1	<b>-3.5</b>
Age 55 to 64	16.1	<b>1-1</b>	2.7	-.1	<b>2.8</b>
Female	16.5	<b>16.8</b>	3.2	.1	<b>-3.5</b>
Male	1.3	<b>7.0</b>	-1.8	.1	<b>-3.7</b>
Black, not Hispanic	8.7	<b>11.7</b>	1.8	.3	<b>-4.7</b>
Hispanic	16.2	<b>16.7</b>	1.0	.3	<b>-1.7</b>
White, not Hispanic	7.5	<b>10.8</b>	.3	0.0	<b>-3.3</b>
Other race, not Hispanic	17.4	<b>19.7</b>	.3	.5	<b>-2.7</b>
Bachelor's degree or higher	.3	<b>3.3</b>	-1.1	.1	<b>-1.9</b>
Some college	-5.5	<b>1.3</b>	-.4	-.2	<b>-6.2</b>
High school diploma	-5	<b>7.0</b>	.6	0.0	<b>-7.6</b>
No high school diploma	-.1	<b>5.2</b>	.9	.2	<b>-6.1</b>

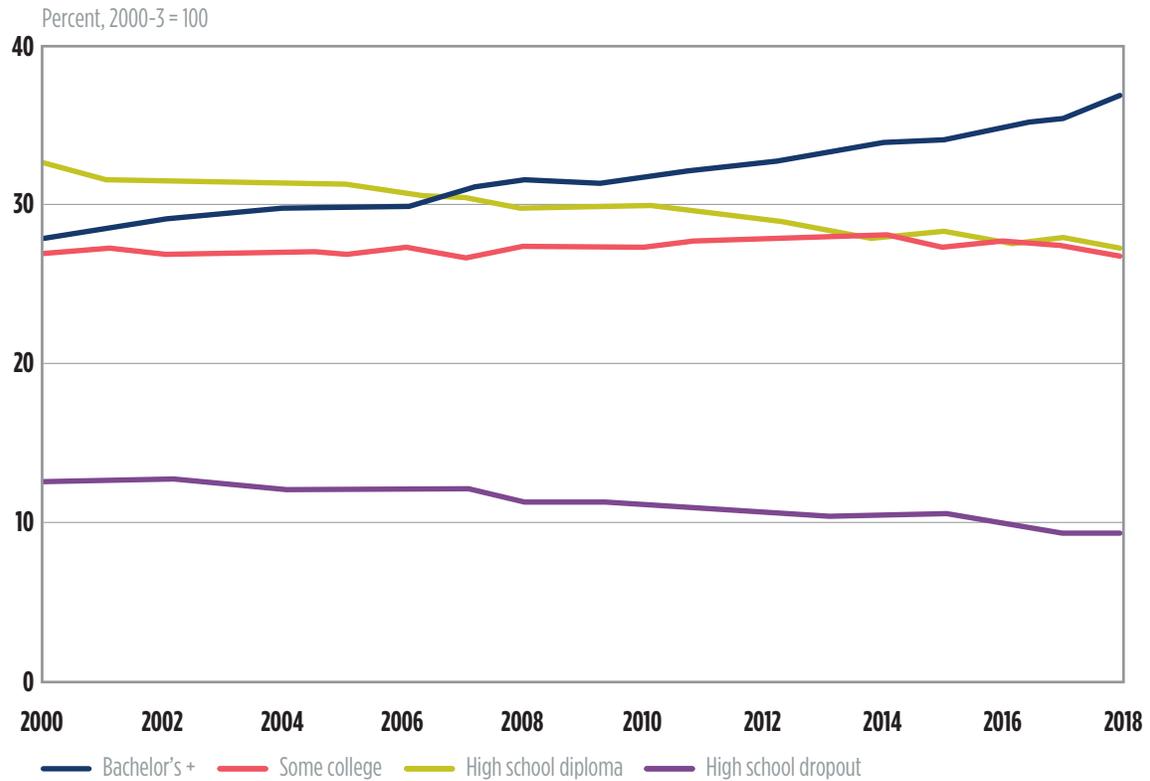
Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Structural measures are in bold. Per capita earnings and its components for 2000-3 are the average values of the data for that time period. Data are for people age 25 to 64. Earnings are adjusted for inflation using the PCE price index.

Now let's discuss what's behind rising earnings per hour since 2000. Table 2 shows that while hourly earnings grew 10.1 percent overall and grew for every group, there were large differences in the magnitude of growth across groups. For example, women's hourly earnings grew nearly two and a half times men's since 2000. The largest outliers, though, were the education groups. Oddly, hourly earnings for all four groups increased less than the aggregate growth rate. How is this possible? It turns out that there has been a substantial change in the educational composition of working-age people—the population has gotten much more educated. Figure 6 shows that since 2000, the

share of people age 25 to 64 with a bachelor's degree or higher has increased from 28 percent to 37 percent, with most of those gains coming from a decline in the share of people with only high school diplomas. Because people with bachelor's degrees earn much more on average than people with only a high school diploma, this compositional shift raised aggregate hourly earnings even though hourly earnings for those with a bachelor's degree moved up only a little. To further understand the relationship between rising education levels and rising hourly earnings, we converted the data on degree attainment into an estimate of years of schooling and took the average

**Figure 6. Population education shares**

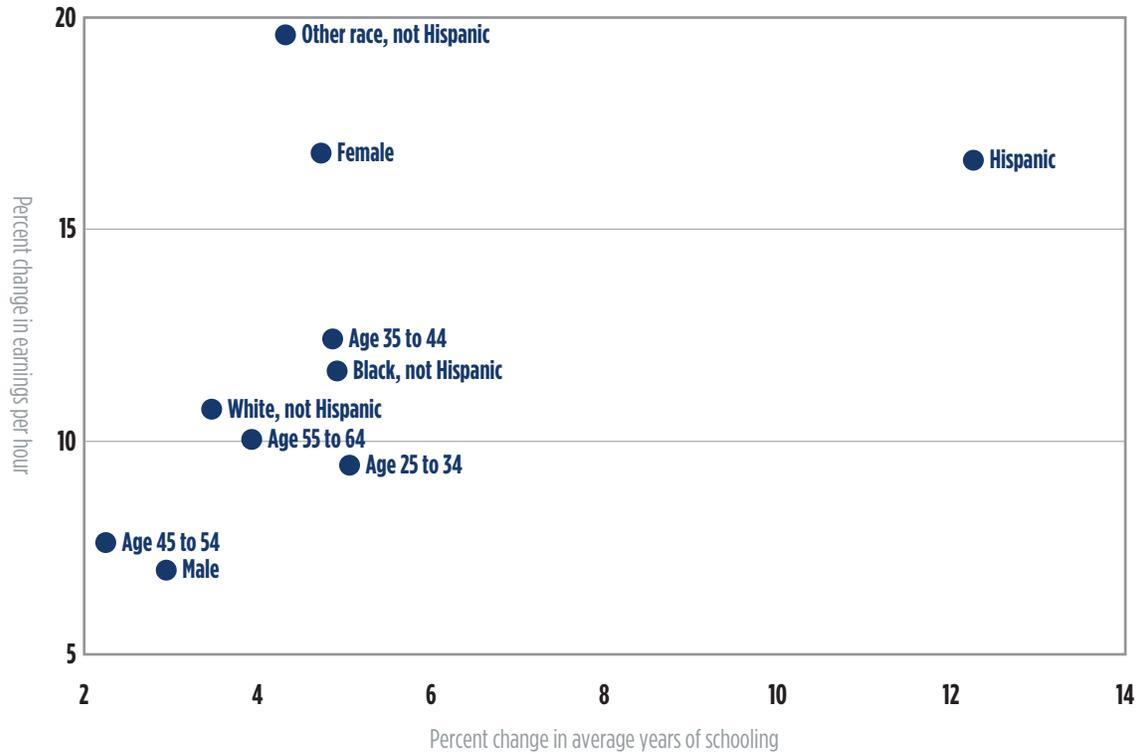


Source: Authors' calculations using data from the Bureau of Labor Statistics.  
 Note: Data are for people age 25 to 64.

for each of our population groups. Figure 7 shows the correlation between the percent change in average years of schooling and the percent change in hourly earnings. There is a clear positive relationship between the two. For example, since the early 2000s, average years of schooling increased the most for Hispanics (12 percent) and they also achieved one of the largest gains in hourly earnings (17 percent). It is clear that

other factors are at play as well because women experienced a similar increase in hourly earnings, but with a much smaller increase in years of schooling. Nevertheless, rising education levels go a long way in explaining the increase in hourly earnings since 2000. While the largest gains in earnings per hour since 2000 have gone to women and minority groups, it is important to note that earnings levels for those

**Figure 7. Percent change from 2000-03 to 2017 in earnings per hour and average years of schooling**



Source: Authors' calculations using data from the Bureau of Labor Statistics.  
 Notes: Data are for people age 25 to 64. Earnings are adjusted for inflation using the PCE price index.

groups are still lower than they are for men and whites. Table 3 shows average hourly earnings for 2013 through 2017 by race and education in 2017 dollars. Hourly earnings were 30 percent higher for men than for women, 30 percent higher for whites than for blacks, and 43 percent higher for whites than for Hispanics. Part of the reason that whites earn more than blacks and Hispanics is that whites have higher education levels. However, education cannot explain the gender difference because women have more education than men. In addition, table

3 shows that women and minorities earn less than men and whites when looking at the same education group. For example, men with high school diplomas earn 35 percent more than women with high school diplomas, and whites with high school diplomas earn 22 percent more than blacks and 16 percent more than Hispanics with high school diplomas. What can explain the gender and racial differences in hourly earnings, even within the same education groups? There is a very large body of research in economics that tries to answer this question, and

**Table 3. Average earnings per hour during 2013-17, \$2017**

	Earnings per hour	Share of group		Earnings per hour	Share of group
Females	24	100	Males	31	100
Bachelor's or higher	32	37	Bachelor's or higher	45	33
Some college	20	29	Some college	26	26
High school diploma	17	26	High school diploma	23	30
High school dropout	13	9	High school dropout	17	11
Black, not Hispanic	23	100	Hispanic	21	100
Bachelor's or higher	32	25	Bachelor's or higher	32	18
Some college	20	32	Some college	21	23
High school diploma	18	33	High school diploma	19	31
High school dropout	15	1	High school dropout	15	29
White, not Hispanic	30	100	Other race, not Hispanic	32	100
Bachelor's or higher	40	39	Bachelor's or higher	42	50
Some college	25	29	Some college	22	21
High school diploma	22	27	High school diploma	18	21
No high school diploma	18	5	No high school diploma	15	8

Source: Authors' calculations using data from the Bureau of Labor Statistics.

Notes: Data are for people ages 25 to 64. Earnings are adjusted for inflation using the PCE price index.

a review of it is beyond the scope of this article. Interested readers should consult Blau and Kahn (2017) for a review of the literature on gender differences, Bayer and Charles (2018) for a review of the literature on racial differences, and Altonji and Blank (1999) for a classic comprehensive review of both topics.

## Conclusion

In this article, we explored how the earnings of different population groups have evolved since 2000 in response to both short-run cyclical changes and long-run structural changes. On the cyclical side, we found that the Great Recession had the largest impact on people with lower levels of experience and education. On the structural side, we found that labor force participation declined for almost all groups, but decreased the most for lower-educated groups. We also found that increases in a population group's hourly earnings are closely related to increases in the education level of the group.

And because education levels rose more for women and minorities, they experienced the larger hourly earnings gains. That said, women and minorities still earn less per hour than men and whites.

Taken together, the data presented in this article make clear that education levels are very important for understanding why the economic fortunes of different population groups have evolved the way they have in recent years. This is not surprising given the strong worldwide evidence on the large positive returns to education (Psacharopoulos and Patrinos [2018]). Policies that improve access to quality education are therefore likely to play a key role in continuing the progress that minority groups have made since 2000 in closing the earnings gap.

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## Notes

1. Details on how the data in this article were constructed are available from the authors upon request.
2. Age groups are 25 to 34, 35 to 44, 45 to 54, 55 to 64; sex groups are female and male; race and ethnicity groups are black not Hispanic, white not Hispanic, other race not Hispanic, and Hispanic; and education groups are no high school diploma, high school diploma, some college, bachelor's degree and higher.
3. Many studies call a different measure, the employment-to-population ratio ( $\frac{\text{workers}}{\text{population}}$ ), the employment rate.
4. The exact conversion requires the use of natural logarithms. For example, for a variable  $X = Y \cdot Z$  at a given time,  $X_t = Y_t \cdot Z_t$ , the proportional change relative to a base year is  $\frac{X_t}{X_{base}} = \frac{Y_t}{Y_{base}} \cdot \frac{Z_t}{Z_{base}}$ . By applying natural logarithms to both sides, we have  $\log\left(\frac{X_t}{X_{base}}\right) = \log\left(\frac{Y_t}{Y_{base}} \cdot \frac{Z_t}{Z_{base}}\right)$ , which is equivalent to  $\log\left(\frac{X_t}{X_{base}}\right) = \log\left(\frac{Y_t}{Y_{base}}\right) + \log\left(\frac{Z_t}{Z_{base}}\right)$ . Proportional changes expressed as  $\log\left(\frac{X_t}{X_{base}}\right)$  are often referred to as “log points.” And for small changes, log and percentage point changes are very close.

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## Biographies

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