

Chicago Fed Letter

When it comes to wage growth, the measure matters

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Average wages are a closely watched economic indicator. The growth rate of average wages can help tell us, for example, how workers' living standards are changing, whether employers face rising costs that they might pass through to consumer price inflation, and whether the labor market is tight or has room to improve further. In the realm of monetary policy, the last two applications are particularly important because they can help people assess the outlook for the Federal Reserve's "dual mandate" of price stability and maximum employment.

Given the many important reasons to keep an eye on wage growth, economists have developed a wide range of ways to measure it. Naturally, the best way to measure wage growth depends on the reason you are making the measurement—some statistics are better if you want to get a handle on

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living standards, while other statistics may be more helpful in identifying inflationary pressures. But despite the importance of matching the statistic to the economic question you want to answer, the various indicators of wage growth are not always put to their best uses. In this *Chicago Fed Letter*, we review several key dimensions along which wage growth statistics vary and highlight

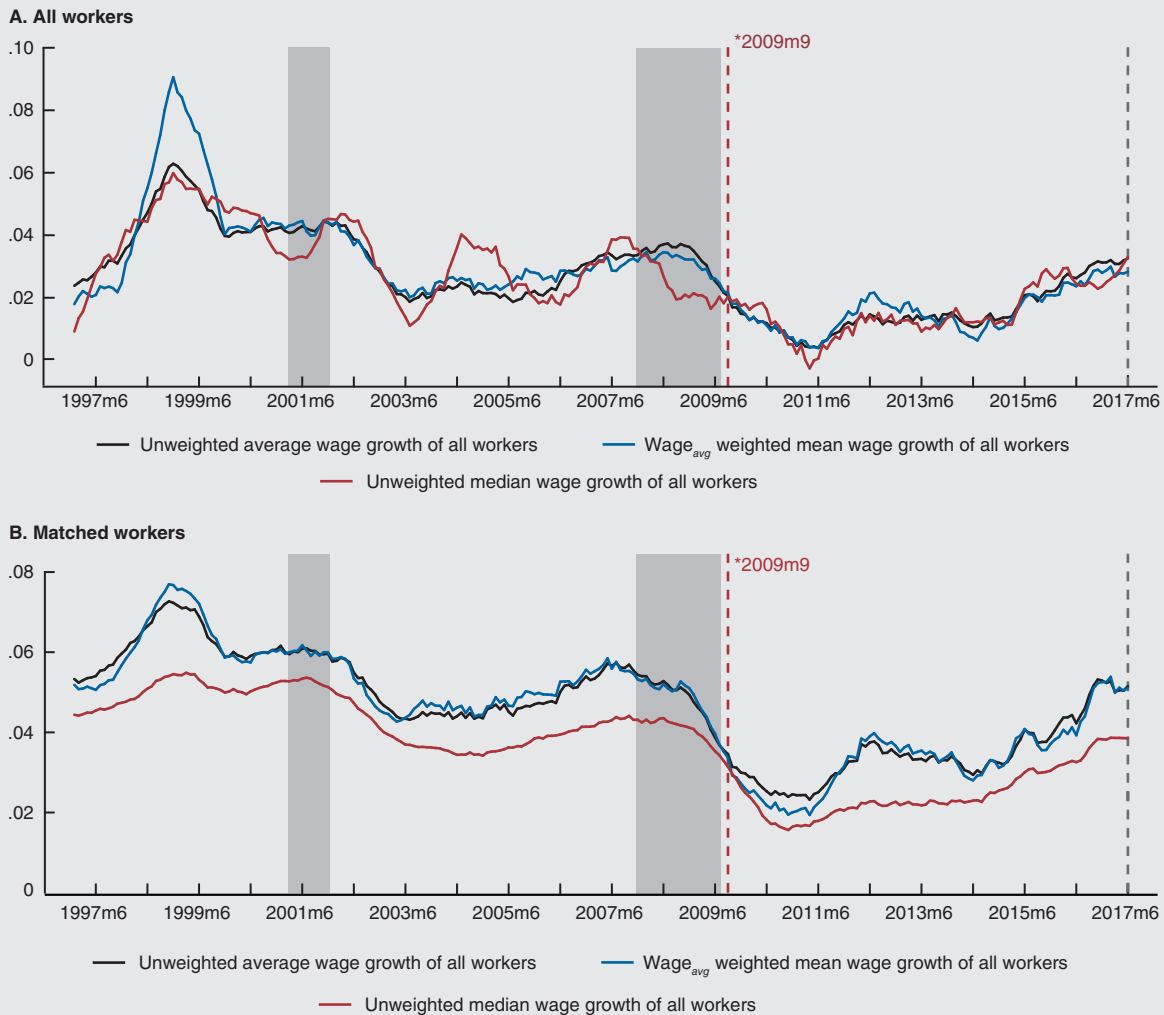
which statistics are most useful for answering different economic questions.¹ We find that even when the statistics are constructed from a single data set, different ways of doing the calculations can lead to significantly different estimates of the rate of wage growth and how it is changing over time—differences that we need to understand to draw accurate conclusions about the economy.

Three key choices

Figure 1 illustrates six different measures of *average* wage growth, which together highlight three key choices in constructing these measures. These choices are: 1) which workers we include in the calculation; 2) whether we count low-paid and high-paid workers equally in the calculation; and 3) how we define average when we talk about average wage growth. All of the data in the figure, and the rest of the article, come from the *Current Population Survey* (CPS), a data set collected monthly by the U.S. Census Bureau and U.S. Bureau of Labor Statistics.

Before we explain the choices in detail, we highlight just how different wage growth appears depending on what choice we make. As of June 2017, depending on how we measure it, the six

1. Wage growth of matched and unmatched workers



NOTES: Panel A plots the unweighted median, unweighted mean, and wage-weighted mean wage growth for all workers. Unweighted series use only the sampling weights while the wage-weighted series weights by the product of the sampling weight and wage. Panel B plots comparable series using the matched CPS sample. Matched workers are weighted using their sampling weights when computing the unweighted series, and the product of the sampling weight and each individual's average wage when computing the weighted series. Topcoded workers are excluded from the sample.

SOURCE: Authors' calculations based on data from the *Current Population Survey*.

series in figure 1 show annual rates of wage growth that range from just 2.8% to as high as 5.1%. But the differences among the series are not constant. In September 2009, the gaps had largely closed, with wage growth rates across the series clustered in a band from 2% to 3.5%. And the ranking of the series can change; a series that was the fastest growing in the late 1990s (the blue line in panel A) is now the slowest growing. These large differences across measures mean that the choice of which wage measure to examine can be quite important in determining what results we find—potentially as important as the actual economic changes we might seek to understand.

Our first choice is which workers to include in our calculation of average wage growth. If we want to measure wage growth between two months—say, January 2016 and January 2017—we have two basic options for which workers' data to use. In panel A of figure 1, we use data on all of the workers who happened to be employed in each month and had complete wage information in the CPS.² That is, to measure wage growth from January 2016 to January 2017, we compare the average wages of everyone who happened to work in January 2016 with the average wages of everyone who happened to work in January 2017. This strategy includes the broadest possible group of workers in the calculation, but it has a significant drawback: The people who worked in January 2016 aren't

necessarily the same as the people who worked in January 2017, and we don't know whether average wages changed because workers got raises or because different people were working. In panel B of figure 1, we address this drawback by using only the data on workers who were employed at both the beginning and the end of the year—for example, those who were employed in both January 2016 and January 2017. In this sample, because we observe the same worker's wages at two points in time, we can compute the wage growth rate of each worker separately and then calculate the average of these growth rates across workers. The measures using these “matched” workers fluctuate much less over time, precisely because they leave out changes in who is working. We will see that leaving out these fluctuations is appropriate for some purposes and not for others.

The second choice highlighted in figure 1 is whether we count all workers equally (the lines labeled “unweighted”) or pay more attention to those with higher earnings (the lines labeled “wage-weighted”). If we are interested in the living standards of the average worker, then clearly we should count all workers equally in our calculation. However, if we are interested in the perspective of a firm considering how its payroll costs are changing—and whether to pass through payroll costs to consumer prices, thereby influencing the inflation rate—we would want to separate workers by salary level. We know that a 5% wage increase for one high-paid worker has much more impact on the firm's total costs than the same percentage increase for one low-paid worker. The figure shows that, at times, the wage-weighted measures that are potentially most relevant for inflation grow significantly faster or slower than the unweighted measures that are potentially most relevant for average living standards.³

The third choice highlighted in figure 1 is how we define average when we talk about average wage growth. The figure demonstrates that the mean growth rate of wages often moves quite differently from the median (the point that half of workers lie above and half lie below). This occurs because the wage growth of workers who are far away from average has different impacts on the mean than on the median.

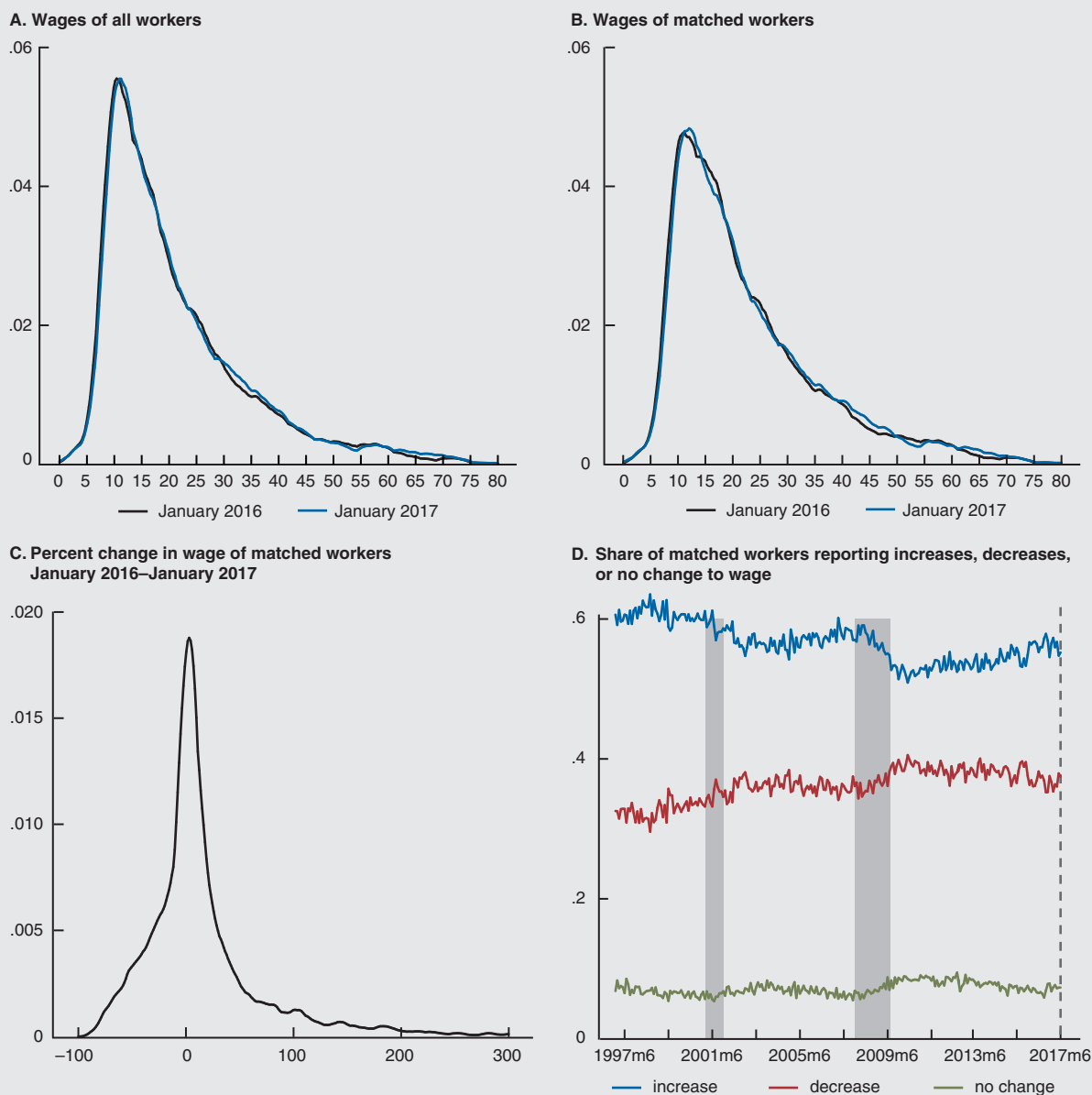
To match or not to match?

In figure 2, we examine more closely the choice of which workers to include in the calculation. Panel A shows the distribution of hourly wages of everyone who worked in January 2016 and compares it with the distribution of hourly wages of everyone who worked in January 2017.⁴ The distributions are quite similar. Panel B shows the distribution of hourly wages only for those people who worked in both January 2016 and January 2017; although the distributions are still similar, the distribution for 2017 is now somewhat shifted to the right—meaning workers were getting higher wages—relative to the distribution for 2016.

Why does the distribution change more for matched workers than for all workers, even though by looking at matched workers we have removed any changes that might result from differences in who is working in the two months? An important factor is the effect of experience on wages. Workers' earnings tend to rise as they gain work experience. Because matched workers are the people who are gaining experience, their wages tend to rise and the wage distribution for matched workers tends to shift to the right over time. However, for the work force as a whole, total experience does not tend to change much over time, because the most-experienced workers are constantly retiring and being replaced by younger people with no experience. Thus, the distribution of wages for all workers does not tend to shift to the right as much over time.

More generally, the distribution for matched workers isolates the changes experienced by particular workers, while the distribution for all workers also includes the effect of changes in who is working. One of these changes, though by no means the only one, is the constant replacement of retirees with new workers. Which distribution we should look at depends on the question we want to answer. If we want to know whether particular workers are earning more, the data on matched workers

2. Density of wages and wage growth

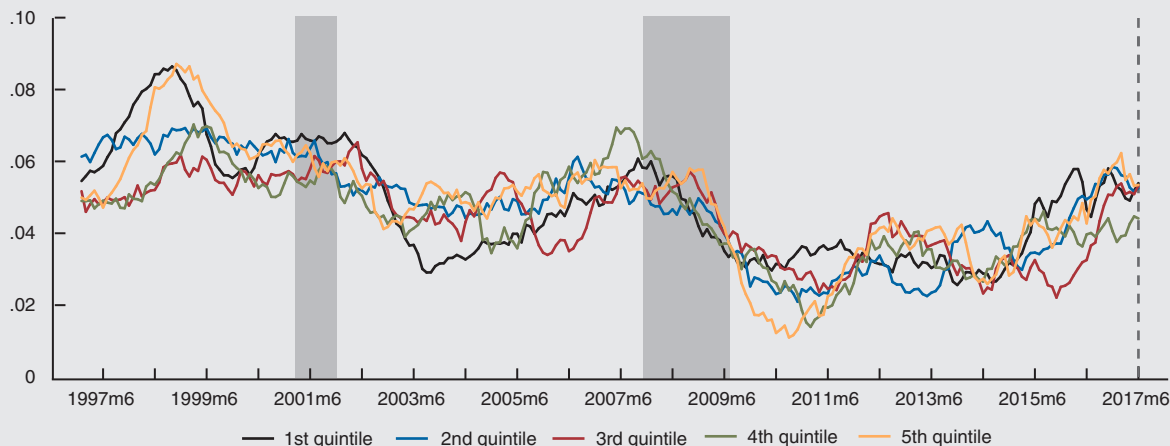


are more helpful; whereas if we want to know about compositional shifts in the work force, we need to look at all workers.

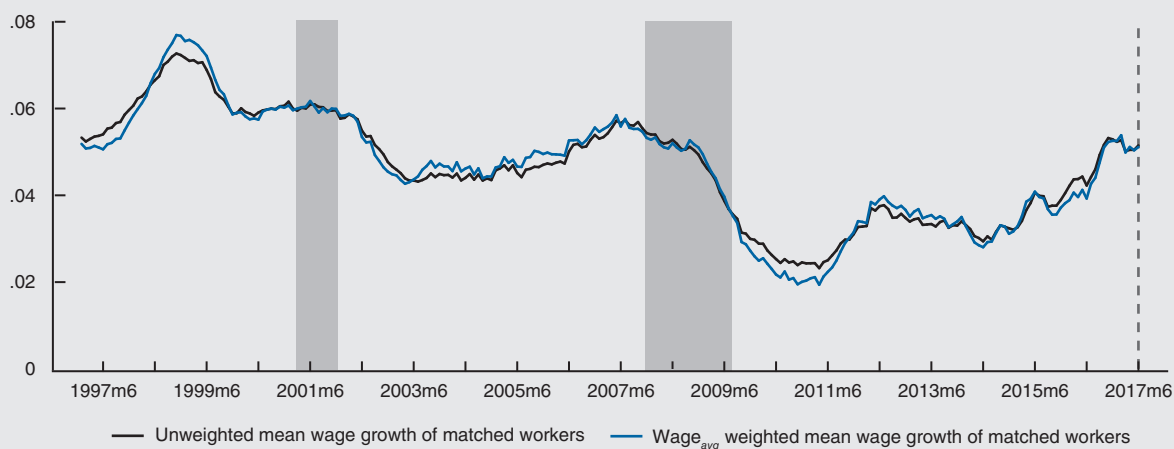
Panel C of figure 2 calculates the percentage increase or decrease in the wage reported by each matched worker and then looks at the distribution of these wage changes. When we calculate average wage growth using data on matched workers, we are really calculating statistics of the distribution in this panel, such as its mean or median. Panel D looks at what fraction of workers report a wage increase, decrease, or no change at each point in time. Typically, about 60% report a raise, about one-third report a wage cut, and about 7% report no change at all. But as wage growth has trended down over the two decades in our sample, fewer workers have been reporting raises, and there was an especially noticeable drop during the Great Recession. In the remainder of this

3. Log change in wage, matched workers

A. Mean log change in wage between time t and $t + 12$



B. Mean log change in wage for matched workers



NOTES: Panel A plots mean log wage growth separately for workers in each quintile of the distribution of the average of the worker's wage at time t and $t + 12$. Panel B plots unweighted and wage-weighted log wage growth. Topcoded workers are excluded from the sample.
SOURCE: Authors' calculations based on data from the *Current Population Survey*.

article, for simplicity and to more cleanly illustrate other aspects of the average wage calculation, we compute all of our statistics using data on matched workers.

Differences across the income distribution

As we indicated earlier, one important choice in the calculation is whether to count all workers equally or to weight high-wage workers more in the calculation in order to better reflect what is happening to employers' total wage bills. Figure 3 shows why this choice matters. Panel A of the figure shows the mean change in wage over a year for workers at different places in the income distribution. The line marked first quintile, for example, shows the wage growth rate of workers whose wages are in the bottom 20%, while the line marked fifth quintile shows the wage growth rate of workers whose wages are in the top 20%.⁵ Usually the trends in wage growth are similar across the quintiles, but important differences emerge at times. In mid-2009 through 2010, just after the Great Recession, wage growth was substantially higher for lower-wage workers. That means employers' wage bills were growing more slowly than the average wage, because total wage bills depend disproportionately on the pay of high-wage workers. Consider an employer with two workers, one making \$15 an hour and the other making \$50 an hour. If the low-paid worker gets a 10% raise and the high-paid worker gets a 2% raise, average wage growth is 6%, but the employer's total wage bill goes up by just 3.8%. By contrast, in 1999 and in the mid-2000s, higher-wage workers

had higher wage growth, which means employers' wage bills were growing faster than the average wage would have indicated.⁶

Panel B of figure 3 illustrates this difference between average wage growth and the growth of total wage bills. The black line is the average wage growth rate of matched workers, weighting all workers equally. The blue line is the average wage growth rate, weighting workers according to their wages, to reflect what is happening to total wage bills. In 1999 and in the mid-2000s wage-weighted wage growth is faster than unweighted wage growth, while in 2010 wage-weighted wage growth is slower than unweighted wage growth.

The appropriate way to weight wage changes depends, for the most part, on whether we are answering a question about workers or about employers. If we want to know what is happening to the typical worker, there is no reason to put more weight on some workers than others; we should treat all workers equally and use the unweighted data. Indeed, we might also want to use a picture like panel A of figure 3 to zero in on what happens to workers in different income groups. But if we want to know what is happening to the typical firm's labor costs, we need to pay attention to the total wage bill—and that requires weighting by wages, because the total wage bill depends more on the wages of higher-paid workers.

Conclusion

Average wage growth is an important indicator for understanding many aspects of the economic outlook. But average wage growth is not a single statistic. In this article, we have reviewed three key choices in calculating average wage growth and found that these choices lead to a variety of different statistics that are appropriate for different purposes.

Still, it is important to recognize that, regardless of how we calculate it, wage growth is not a perfect proxy for the other variables it is sometimes used to understand. Rising wages do not imply rising living standards if the cost of living is rising at the same time. And rising wages do not have to lead to inflation if firms pay for the higher wages by cutting the profits that are returned to shareholders or by increasing workers' productivity (and thus reducing the firms' costs). Making the step from wage growth to living standards or inflation thus requires data beyond wages alone.

¹ Our focus throughout is on measuring the rate of change of workers' wages. The changing value of benefits, such as health insurance and retirement plans, is also important but requires different data than we consider here.

² Throughout this article, we drop data on workers whose wages are "topcoded," which means the CPS reports only that their earnings were above some prespecified upper bound—an annual salary of \$150,000 in most years. We drop these workers because it is impossible to compute the percentage change in their wages from one year to the next.

³ It should be noted, though, that wage growth need not always lead to inflation; for example, if wage growth accompanies rising productivity.

⁴ For people who are paid a monthly or annual salary, hourly wages are calculated by dividing the salary by hours worked.

⁵ Workers are classified by their average wage over the year, rather than their wage at the beginning or end of the year, to avoid mechanical patterns that could result from measurement error in wages.

⁶ To get the best measure of the growth of wage bills, in principle we would want to weight workers not only by their wages but also by their hours. However, this strategy would introduce a number of measurement complications, so we do not pursue it here.

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