

# Chicago Fed Letter

## Estimating the trend in employment growth

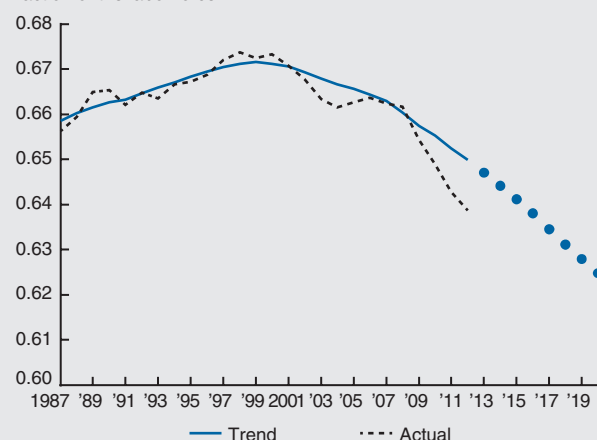
by Daniel Aaronson, vice president and director of microeconomic research, and Scott Brave, senior business economist

For the unemployment rate to decline, the U.S. economy needs to generate above-trend job growth. We currently estimate trend employment growth to be around 80,000 jobs per month, and we expect it to decline over the remainder of the decade, due largely to changing labor force demographics and slower population growth.

### 1. Labor force participation and population growth

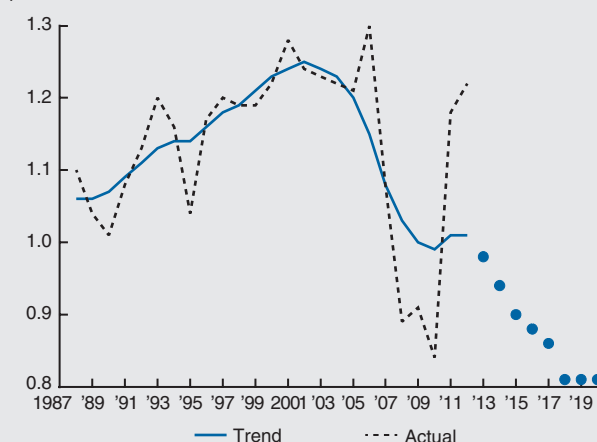
#### A. Labor force participation, trend vs. actual

fraction of the labor force



#### B. Population growth, trend vs. actual

percent



NOTES: The figure displays the recent history and projections for two of the four inputs into our calculation of trend payroll employment. Each separate chart includes our estimate of the historical trend (blue solid line), the historical data for the input used to calculate the trend, (black dotted line) and future projections for the trend (blue dots).

SOURCES: Haver Analytics and authors' calculations.

The Federal Reserve has indicated it will maintain monetary policy accommodation until the labor market has made substantial improvement. Given that unemployment remains relatively high, a substantial improvement in the labor market will require well-above-trend job growth.

According to our analysis, job growth of more than about 80,000 jobs per month would put downward pressure on the unemployment rate, down significantly from 150,000 to 200,000 during the 1980s and 1990s. We expect this trend to fall to around 35,000 jobs per month from 2016 through the remainder of the decade. These estimates rely on several assumptions, notably about future labor force participation and immigration.

Therefore, we discuss several plausible alternative scenarios that would raise or lower our estimate of trend employment growth. Our baseline estimate of the payroll employment gap, i.e., the difference between actual payroll employment and our baseline estimate of trend employment growth, suggests that payroll employment was about 6 million jobs, or 4%, below trend in 2012. Closing this gap by 2016, for instance, would require payroll employment growth of about 195,000 per month on average over the next four years.

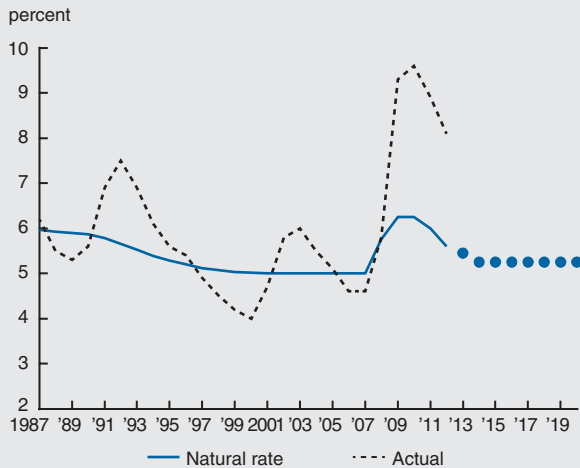
#### How do we measure trend employment growth?

We calculate trend payroll employment annually from 1987 through 2020 from the product of four estimated components: the trend labor force participation rate; the trend civilian noninstitutional population aged 16 and older; one minus the natural rate of unemployment; and the trend ratio of payroll to household survey employment. Trend payroll employment *growth* is the monthly average change implied by this constructed annual series.

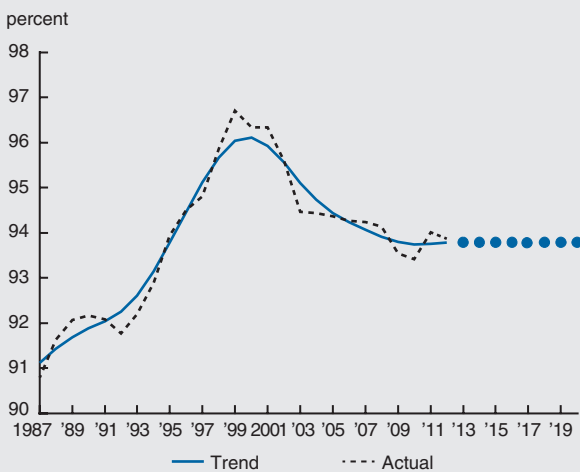
The labor force participation rate captures the percentage of the civilian non-institutional population aged 16 and older that is employed or actively seeking employment. Our measure of the *trend* labor force participation rate is calculated from a series of statistical models

## 2. Unemployment rate and payroll–household ratio

### A. Unemployment rate, natural rate vs. actual



### B. Ratio of payroll to household employment, trend vs. actual



NOTES: The figure displays the recent history and projections for two of the four inputs into our calculation of trend payroll employment. Each separate chart includes our estimate of the historical trend (blue solid line), the historical data for the input used to calculate the trend, (black dotted line) and future projections for the trend (blue dots).

SOURCES: Haver Analytics and authors' calculations.

that estimate the probability that an individual is in the labor force as a function of their gender, age, year of birth, race, education, and a few macroeconomic and institutional factors.<sup>1</sup> The model is estimated using data from the 1987–2007 U.S. Bureau of Labor Statistics' (BLS) *Current Population Survey* and extrapolated through 2020.<sup>2</sup>

Figure 1, panel A plots our estimate of trend labor force participation against actual labor force participation since 1987. Growth in the trend rate during the late 1980s and 1990s reflects an increase in female labor force participation and the baby boomer

generation reaching their prime working years. Since 2000, however, participation has been steadily declining. We forecast that trend will continue to decline by roughly 0.3 percentage points per year through at least 2020.

Both the historical data and projections for the civilian noninstitutional population aged 16 and older are from the U.S. Census Bureau.<sup>3</sup> We smooth the data to adjust for the irregular timing of data collection and revisions produced by the decennial censuses and filter it to isolate a trend component.<sup>4</sup> Multiplying our trend population estimates by our trend labor force participation rate produces a time series for the trend labor force.

As shown in figure 1, panel B, trend population growth also climbed steadily through the 1990s, peaking in the early 2000s at about 1.25%. It then decelerated before stabilizing in recent years at about 1%. While actual population growth has bounced back some, the Census Bureau expects it to fall until 2018 and then stabilize at just over 0.8% per year.

The natural rate of unemployment represents the unemployment rate that would prevail in an economy making full use of its productive resources. Our estimate of the natural rate of unemployment coincides with the Congressional Budget Office's long-run measure through 2007. Starting in 2008, we use estimates

of short-run factors that temporarily raise the natural rate above its long-run value.<sup>5</sup> By multiplying the trend labor force by one minus the natural rate of unemployment, we arrive at a measure of trend employment that is consistent with the BLS's household survey of employment from which the unemployment rate is calculated.

The natural rate of unemployment declined from almost 6% in the late 1980s to 5% by the turn of the century (figure 2, panel A). We estimate that it rose sharply during the 2007–09 recession to 6.25% before declining gradually since 2010. We project that this decline will continue at a measured pace until the natural rate reaches 5.25% in 2014.

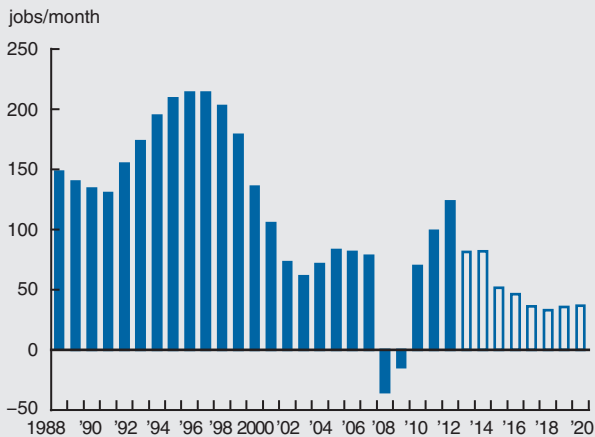
Finally, to derive an estimate of the trend in the more commonly referenced BLS payroll survey of employment requires an additional multiplication by the trend ratio of payroll to household survey employment.<sup>6</sup> The trend ratio of payroll to household employment recently stabilized at just below 94% after a long ascent during the 1980s and 1990s and subsequent decline since 2000 (figure 2, panel B).<sup>7</sup> We expect it to stay at its 2012 level of 93.8% going forward.

### Our estimates of trend employment growth

Figure 3 plots our estimate of trend employment growth from 1988 to 2020. Trend payroll employment grew by roughly 150,000 jobs per month during the late 1980s and early 1990s and roughly 200,000 jobs per month during the mid- to late 1990s. In the early 2000s, trend employment growth fell to under 100,000 jobs per month, where it has roughly remained.

The historically high rates of trend job growth in the late 1980s and 1990s were driven by a confluence of all four factors described above—an increase in the trend labor force participation rate, an increase in the ratio of payroll to household survey employment, higher population growth, and a decline in the natural rate of unemployment. The former two factors reversed course around the turn of the century, causing trend payroll employment growth to fall.

### 3. Trend payroll employment growth



NOTES: The figure depicts the average monthly change in the trend in payroll employment on an annual basis. Solid blue bars denote estimates based on historical data, while open blue bars signify estimates based on projected data.  
SOURCES: Haver Analytics and authors' calculations.

During the recent recession, trend payroll employment growth even dipped below zero, driven by a sharp rise in the natural rate of unemployment. Trend payroll employment growth has subsequently picked up during the recovery, averaging roughly 100,000 jobs per month since 2009. We project trend employment growth to slow to about 80,000 per month over the next two years and then drop to roughly 35,000 jobs per month, on average, from 2016 to 2020.

The projected slowdown is based on 1) a continuing decline in trend labor force participation attributable to the aging of the baby boomer generation and 2) a lower level of projected population growth going forward. The Census Bureau projects a significant slowdown in population growth from the 1.00%–1.25% rate that prevailed for the two decades prior to the most recent recession (figure 2, panel A).

#### Alternative estimates

Our forecast of trend employment reported in figure 3 is based on a number of assumptions. To get a feel for the sensitivity of these estimates, we next consider a number of alternative scenarios.

First, rather than using the Census Bureau's population projection (figure 1, panel B), we project trend population growth to hold near its current level of 1% throughout the remainder of the

second half of this decade, as opposed to about 35,000.<sup>8</sup>

The key uncertainty with regard to population growth is immigration. Immigration fell significantly in response to the recession and has yet to recover. In response, the Census Bureau revised its immigration projection downward. But it is plausible that immigration may increase more than the Census Bureau's forecast as firms look abroad to make up for the declining labor force participation of domestic workers. Allowing immigration levels to catch up to the Census Bureau's 2008 forecasted path by 2020 implies trend employment growth of around 100,000 jobs per month over the next two years and, on average, about 65,000 during the second half of this decade.

Second, our baseline estimate assumes that the trend labor force participation rate declines by roughly 0.3 percentage points per year. As seen in panel A of figure 1, labor force participation has been running below its trend for quite some time. Alternatively, suppose labor force participation drops by 0.1 or 0.5 percentage points per year, reflecting our uncertainty about the extent to which lower participation should be in the trend or the cycle. This alteration would add or subtract about 35,000 jobs per month, on average, from our baseline trend payroll employment growth projection.

decade. This is close to the Census Bureau's alternative "high" projection for population growth. This projection has only a small effect on our estimates of trend employment growth in 2013, 2014, and 2015, but adds roughly 20,000 jobs per month, on average, to our baseline estimate after 2015. This would imply trend payroll employment growth of about 55,000 jobs per month over the

Third, suppose the trend payroll–household ratio converges slowly to 95%, its level during the late 1990s and early 2000s, instead of our baseline assumption of 93.8%. This change would add about 20,000 jobs per month to trend payroll employment growth.

Finally, we investigated the impact of our long-run natural rate assumption of 5.25% on our projections. If we were to allow the natural rate to return to its pre-recession level of 5% in 2015, this would add roughly 30,000 jobs per month to our estimate of trend payroll employment growth in that year alone.

If we take the most optimistic assumptions into account, trend payroll employment growth could average a bit more than 120,000 jobs per month over the second half of the decade, roughly where it stood in 2012. Likewise, the most pessimistic assumptions would result in little or no growth in trend employment growth, on average, over the same period. We view 20,000–50,000 jobs per month, on average, to be a reasonable range and about 35,000 per month to be a plausible baseline.

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## Conclusion

We estimate that, currently, employment growth above about 80,000 jobs per month would put downward pressure on the unemployment rate. Likewise, anything short of this benchmark would push the unemployment rate up. These estimates are lower than the conventional wisdom that 100,000 to 150,000 jobs per month are needed to lower the unemployment rate. Moreover, we expect trend employment growth to decline

over the coming years, such that even our most optimistic scenarios for labor force participation and immigration fall at or below today's conventional wisdom.

That said, employment growth has been well short of trend since 2008, opening up a large gap between trend and actual payroll employment. We expect this gap to slowly narrow as a result of above-trend growth in economic activity over the next few years. For instance, average

job gains of about 240,000, 195,000, or 165,000 per month over the next three, four, or five years would close the gap. When economic activity finally stabilizes at its trend, our estimates suggest that employment growth, and consequently growth in the number of total hours worked, will be slower than in the past. This has ramifications for the potential speed at which the economy can grow in the future.

<sup>1</sup> For details, see Daniel Aaronson and Daniel Sullivan, 2001, "Growth in worker quality," *Economic Perspectives*, Federal Reserve Bank of Chicago, Vol. 25, Fourth Quarter, pp. 53–74, and Daniel Aaronson, Jonathan Davis, and LuoJia Hu, 2012, "Explaining the decline in the U.S. labor force participation rate," *Chicago Fed Letter*, Federal Reserve Bank of Chicago, No. 296, March.

<sup>2</sup> The model is estimated on the population of 16–79 year olds. We convert the trend participation rate for this population to the population aged 16 and older using a cyclically adjusted measure of the ratio of labor force participation rates for the population segments aged 16–79 years old and 16 and older.

<sup>3</sup> We use projected growth rates for the resident population aged 16 and older from the Census Bureau. While the growth rates of the resident and civilian noninstitutional population series can differ from year to

year, on average, since 1960 these differences have been minor.

<sup>4</sup> We use the Hodrick–Prescott (HP) filter to isolate the trend in population from 1987 to 2020. To avoid the standard end-of-sample problem with the HP filter and because the Census Bureau's projection of trend population is superior to a statistical estimate from an HP filter, we replace the HP-filtered trend with the Census Bureau's projections after 2015.

<sup>5</sup> These structural factors include estimates of occupational and industry job mismatch, which we take from Ayşegül Şahin, Joseph Song, Giorgio Topa, and Giovanni Violante, 2012, "Mismatch unemployment," Federal Reserve Bank of New York, staff report, No. 566, August; and estimates of the labor supply effects attributable to increases in unemployment insurance, which we take from Jesse Rothstein, 2011, "Unemployment insurance and job search in the Great

Recession," *Brookings Papers on Economic Activity*, Fall, pp. 143–210, and LuoJia Hu and Shani Schechter, 2011, "How much of the decline in unemployment is due to the exhaustion of unemployment benefits?," *Chicago Fed Letter*, Federal Reserve Bank of Chicago, No. 288, July.

<sup>6</sup> As with population, we use the HP filter to estimate the trend of this ratio.

<sup>7</sup> The increase and subsequent decline in the ratio of payroll to household employment is evident even when using the payroll-concept adjusted household employment series.

<sup>8</sup> Another alternative path for population growth that we explored was to use the actual census data for population instead of our estimate of its trend. This would raise our estimates of trend payroll employment growth to around 120,000 per month in 2011 and 150,000 per month in 2012, but has only small effects on our estimates from 2013 through 2020.