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Christopher Foote, Shigeru Fujita, Amanda Michaud, Joshua Montes

The analysis in this paper was presented to the Federal Open Market Committee as background for its discussion of the Federal Reserve's 2025 review of its monetary policy strategy, tools, and communications.

Abstract: We suggest a core set of indicators for evaluating the position of the labor market relative to maximum employment. The unemployment rate remains the key indicator of the cyclical position of the labor market, as it is time-tested, is highly correlated with other indicators, and has practical measurement advantages. But other indicators can provide complementary evidence to get a fuller picture of the labor market. A joint analysis of job vacancies and unemployment in a Beveridge curve diagram is helpful when structural shocks affect the labor market and when the labor market is very tight, while the employment-to-population ratio is useful late in expansions, when increases in employment tend to arise from higher labor force participation. Additional indicators—including wage growth and worker flows—can complement the core indicators we discuss. We draw on lessons from the Global Financial Crisis and the COVID-19 pandemic to evaluate the effectiveness of various indicators.

JEL Classification: E24, E32, J23.

Keywords: Maximum employment, unemployment, job vacancies, labor force participation, wages, business cycle.

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1. Introduction and overview

The Federal Reserve's dual mandate is to promote maximum employment and price stability. As described in the Federal Open Market Committee's (FOMC) current Statement on Longer-run Goals and Monetary Policy Strategy, maximum employment is a broad-based and inclusive goal that is not directly measurable and evolves over time, and the uncertain and time-varying nature of the concept implies that policymakers cannot rely on a single indicator or a fixed threshold to assess its level.

The economic environment leading up to the pandemic suggested that the level of maximum employment could be higher than previously believed and, therefore, a robust labor market could be sustained for an extended period without fueling inflation. In contrast, the COVID-19 pandemic highlighted how a large exogenous shock can significantly reduce potential labor supply and the ability of firms and workers to form employment relationships, thus quickly changing the level of maximum employment.

We put forward a core set of indicators for evaluating the position of the labor market relative to maximum employment, highlighting the circumstances under which each indicator is particularly useful as well as practical challenges faced by each. Our analysis draws on lessons from the Global Financial Crisis (GFC) and the COVID-19 pandemic to evaluate the effectiveness of these indicators. We reach the following conclusions:

- The unemployment rate remains the key indicator of the cyclical position of the labor market. It is time-tested and highly correlated with other indicators, and it has practical measurement advantages. Still, other indicators can provide complementary evidence to get a fuller picture of the labor market.
- Job vacancies and the Beveridge curve can help distinguish movements in the unemployment rate driven by changes in aggregate demand from movements driven by changes in the structure of the labor market. Moreover, the Beveridge curve is useful for identifying times when labor market tightness manifests in vacancies with little movement in the unemployment rate.
- The employment-to-population ratio (EPOP) and the labor force participation rate (LFPR) complement the unemployment rate by giving a more complete sense of the labor market's proximity to maximum employment. The EPOP and LFPR are particularly useful indicators in mature expansions when the unemployment rate is low, but the economy may still not be at maximum employment because the LFPR is cyclically low, especially for some socioeconomic groups. Additionally, sharp movements in the LFPR can help identify structural shocks to labor supply and, thus, changes in the level of maximum employment.

Because of their conceptual relationship to maximum employment and their widespread availability and recognition, we think the indicators we highlight should guide discussions about

maximum employment and labor market slack, perhaps complemented by the additional indicators suggested in section 6, including wage growth. The past decade has also seen marked growth in the availability of new, high-frequency labor market data from a variety of public and private sources. These data bring additional information that can be used to more accurately measure the concepts discussed in this paper and to deepen our understanding of the state of the labor market.

2. Maximum employment

Conceptually, the EPOP, as the broadest measure of employment in the economy, is the indicator most closely aligned with maximum employment. However, in practice, economic theory and policymaking have focused on the unemployment rate to assess the position of the labor market relative to maximum employment. In this vein, one definition of maximum employment is the unemployment rate that is expected to prevail after the economy has fully adjusted to business cycle shocks. Crump, Nekarda, and Petrosky-Nadeau (2020) term this concept the long-run unemployment rate (LRU).[1] The LRU evolves with the changing structure and dynamics of the labor market, including demographics, industrial and occupational structure, educational attainment, and longer-run trends among subgroups of the population. These factors are largely nonmonetary in nature.

Another definition of maximum employment is the highest level of employment that the economy can *sustain* while maintaining inflation in line with the FOMC's 2 percent inflation target. One way to operationalize this definition of maximum employment is to consider a stable-price unemployment rate (SPU) as defined in Crump, Nekarda, and Petrosky-Nadeau (2020). An SPU is also very close in concept to the natural rate of unemployment, or U*, that the Federal Reserve Board staff includes in the Tealbook.[2] With inflation expectations well anchored, an increase in unemployment above the SPU will push inflation below its longer-run expected level, where it will remain as long as the unemployment gap persists, absent any other shocks. Changes to the underlying structure of the economy that are expected to persist in the longer run will affect both the LRU and the SPU. However, medium-run, supply-side factors, such as temporary changes in labor market matching efficiency or temporary government policies—like the emergency extension of unemployment benefits—that may affect labor supply, influence the SPU but not the LRU, pushing the SPU above or below the LRU.

[1] The longer-run unemployment rate estimates in the Summary of Economic Projections (SEP) submitted by FOMC participants are closer in concept to an LRU. As defined in the SEP, the longer-run projections of the unemployment rate represent each participant's assessment of where the unemployment rate will converge, over time, under appropriate monetary policy and in the absence of further shocks to the economy.

[2] The Crump, Nekarda, and Petrosky-Nadeau (2020) definition of the SPU is but one possible definition. SPU measures have evolved over time, and which version of the SPU one uses depends on the details of the inflation model being used.

The FOMC's Statement on Longer-Run Goals and Monetary Policy Strategy does not explicitly communicate a definition of maximum employment.[3] Instead, the FOMC characterized maximum employment as a "broad-based and inclusive goal," and it noted that monetary policy would focus on eliminating shortfalls, rather than deviations, from maximum employment. The FOMC's characterization of maximum employment was informed by the economy's performance in the years just before the 2020 framework review, when robust labor market conditions benefited many people—including those who traditionally struggled to find work—and did not generate undue inflationary pressures.

Historically, the FOMC has referred to a level of maximum employment that is sustainable or consistent with price stability.[4] While the FOMC has not explicitly defined maximum employment in relation to price stability in its Consensus Statements, the FOMC has noted the tradeoff between the two mandates that can occur. Indeed, in its 2020 Statement, the FOMC stated that it would consider both "employment shortfalls and inflation deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate."

Because an SPU encompasses consistency with both price stability and longer-run structural changes in the labor market—and, thus, reflects the idea of maximum sustainable employment—we think it is a helpful concept for Committee discussions. And while the unemployment rate remains a valuable indicator of maximum employment, as we will discuss in the next section, we expand our focus to other indicators, including employment, as taking into account employment allows us to capture the dynamics of labor force participation that are important for understanding maximum employment.

3. Unemployment rate

For decades, the unemployment rate has been a closely followed measure of labor market conditions (see figure 1).[5] A key reason is that the unemployment rate has been shown to be more indicative of the cyclical state of the economy than other indicators.[6] Furthermore, the cyclical components of other labor market indicators are highly correlated with the unemployment rate. For example, the unemployment rate and the activity indicator of the Federal Reserve Bank of Kansas City's Labor Market Conditions Indicators (LMCI), an index of the first two principal components of 24 monthly labor market indicators, have a correlation

[3] See Board of Governors of the Federal Reserve System (2020).

[4] Lopez-Salido, Markowitz, and Nelson (2024), in an analysis of historical Federal Reserve statements, argue that successive Federal Reserve leaderships from the 1950s onward have viewed the maximum employment goal of the dual mandate as referring to a sustainable maximum level that is consistent with price stability.

[5] The usefulness of the unemployment rate as an indicator of maximum employment has been written about extensively elsewhere, and so we only highlight a few relevant features here. For additional discussion, see Aaronson and others (2012).

[6] See Fleischman and Roberts (2011) and Fernald and others (2017).

coefficient of negative 0.93 over the period 1992 to 2024.[7] Usually, the unemployment rate captures most of the information other indicators would bring. This also means that other indicators bring the most additional information when this co-movement breaks down. Such situations are typically associated with the presence of supply shocks or when the labor market is very tight. In addition, when large shocks hit the economy, it can be difficult to assess whether the unemployment rate is changing in response to aggregate demand fluctuations or to supply-side factors.

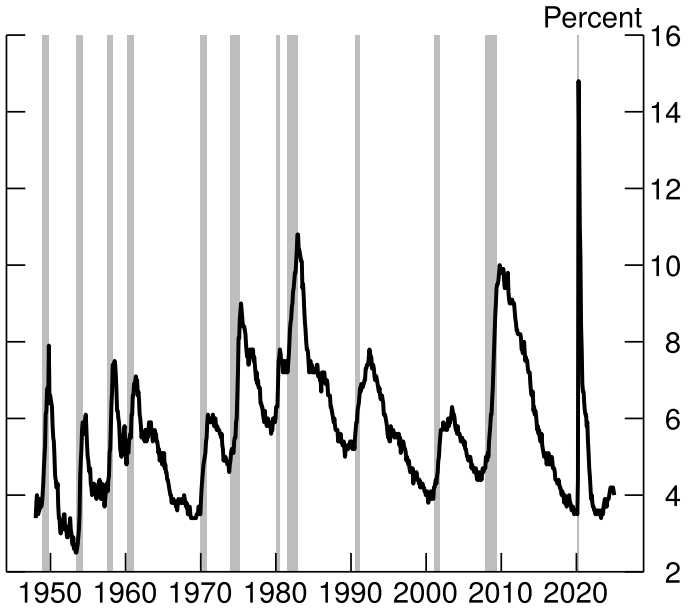
As an indicator, the unemployment rate also has many practical advantages. First, it is well known and well understood by the public, which makes it a useful indicator for communicating about the state of the economy. Second, it is time-tested. The unemployment rate has been consistently measured as a simple and largely unrevised monthly tabulation of a nationally representative sample of households from the Current Population Survey (CPS) since March 1940.[8] Third, the cyclical movements in the unemployment rate are large relative to its trend. These movements have consistently provided a clear signal whenever the U.S. economy has entered a recession. Fourth, the aggregate unemployment rate is broad based and inclusive in the sense that cyclical movements in the unemployment rates of many socioeconomic groups are highly correlated with the cyclical movement of the aggregate unemployment rate, except late in mature expansions, as will be discussed further in section 5.[9]

[7] The LMCI is contemporaneous to the unemployment rate, and so neither has a leading advantage over the other. The LMCI also includes other measures of unemployment like initial claims, U-6, long-term unemployed, and the job-finding rate.

[8] See Dunn, Haugen, and Kang (2018).

[9] The correlation is high, but the volatility of unemployment, or magnitudes of the swings, is known to be larger for some groups, such as Hispanics and Black Americans (Aaronson and others, 2019).

Figure 1. Unemployment rate



Source: U.S. Bureau of Labor Statistics

4. Job vacancies

Readings on job vacancies can provide valuable information on the labor market that complements information provided by the unemployment rate. In particular, the relationship between vacancies and unemployment can help determine whether a given change in unemployment is due to structural, supply-side forces or to changes in labor demand. As we discuss below, increases in job-matching frictions and other structural shocks move unemployment and vacancies in the same direction, while labor demand shocks move them in opposite directions. As a result, the joint analysis of vacancies and unemployment can shed light on the relative importance of structural and cyclical shocks, which is important for gauging the distance from maximum employment.

4.1 The Beveridge curve and the vacancy-unemployment ratio

A central concept in the analysis of labor market shocks is the Beveridge curve, which depicts the combinations of vacancy and unemployment rates that are consistent with the underlying structural frictions in the labor market. Beveridge curves are typically drawn in diagrams like the top portion of figure 2, which plots the vacancy rate on the vertical axis and the unemployment rate on the horizontal axis. Movements along a Beveridge curve occur due to changes in labor demand. A decline in labor demand that reduces the number of vacancies makes it less likely that an unemployed worker will find a suitable vacancy and leave the unemployment pool, so the unemployment rate rises. Consequently, Beveridge curves slope down, although the slope of a curve changes with the unemployment rate. When unemployment is high relative to the number of vacancies, any further reduction in vacancies causes

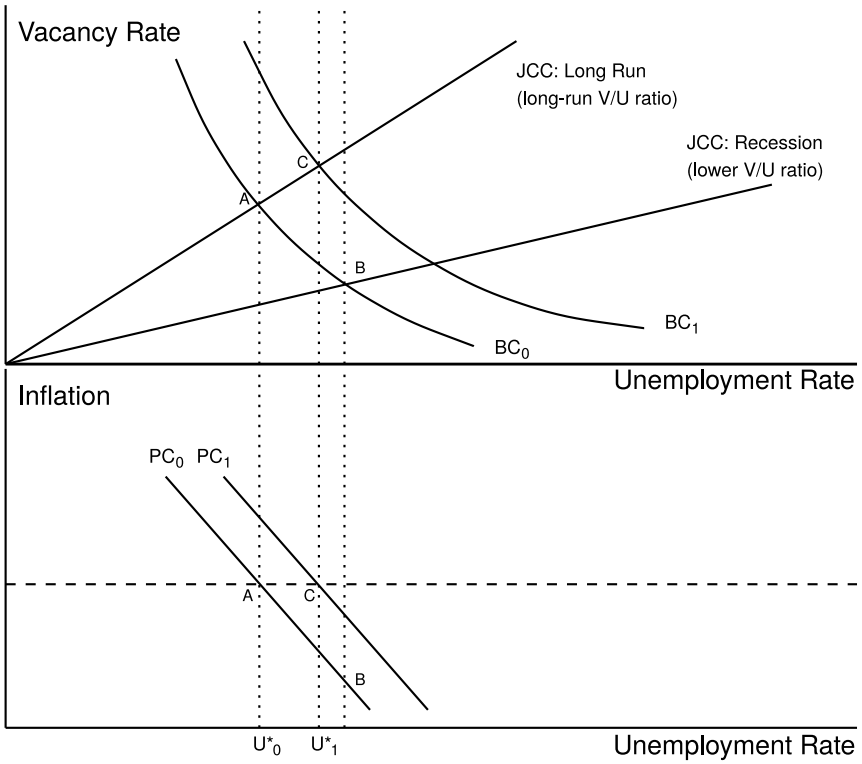
unemployment to rise markedly, so the Beveridge curve is relatively flat. When vacancies are high relative to unemployment, then reductions in vacancies matter little for job-finding and unemployment rates, so the curve is steep.

If structural conditions in the labor market deteriorate, then a given vacancy rate is consistent with a higher unemployment rate, and the Beveridge curve shifts to the right. For example, a rightward shift could arise from higher "mismatch" in the labor market, which occurs when unemployed workers increasingly lack the skills that firms demand. An adverse shift might also result from a stepped-up pace of labor re-allocation, which could be caused by a shift in demand across industries that increases the average layoff rate and thereby increases unemployment at a given level of vacancies.[10]

Given the position of the Beveridge curve, the specific unemployment and vacancy rates that the economy will experience depend on the state of labor demand, which is summarized by the ratio of vacancies to unemployment: the V/U ratio. The V/U ratio tends to be high when firms are eager to hire, and it falls in recessions when labor demand declines. In a Beveridge diagram, the V/U ratio can be depicted as a ray from the origin and is typically labeled the job-creation condition (JCC). The intersection of the JCC with the Beveridge curve determines the unemployment and vacancy rates, which reflect both current supply-side frictions and the current state of labor demand.

[10] See, for example, Abraham and Katz (1986) and Blanchard and Diamond (1989).

Figure 2. The Beveridge curve, job creation condition, and Phillips curve



4.2 How vacancies help identify supply and demand shocks

In figure 2, the ray labeled *JCC: Long Run* is intended to denote labor demand when GDP is at potential, that is, when the labor market is neither overheated nor experiencing slack. Consequently, the intersection of the long-run JCC with the Beveridge curve denotes an unemployment rate that should be consistent with an SPU. If the economy enters a recession and labor demand declines, then the V/U ratio falls and the JCC rotates clockwise to *JCC: Recession.* The economy moves from point A to point B, with lower vacancies and higher unemployment. As a general matter, when labor demand shocks predominate, the economy moves along a stable Beveridge curve, so vacancies and unemployment move in opposite directions. When structural shocks are more important, however, vacancies and unemployment move in the same direction. Consider a rightward shift in the Beveridge curve, from BC_0 to BC_1. Holding constant labor demand at the long-run level, the economy moves along *JCC: Long-Run* from point A to point C, and vacancies and unemployment both increase. The differing theoretical predictions for unemployment and vacancy co-movement provide a way of identifying supply and demand shocks.[11]

[11] In formal search-and-matching models of the labor market, firms' incentives to create jobs can be affected by shifts in the Beveridge Curve. If job-matching frictions increase, then firms may post fewer vacancies, causing the JCC to rotate clockwise at the same time the Beveridge curve shifts out. See Barlevy and others (2024) for details.

In real time, however, it is often difficult to distinguish a movement along the Beveridge curve from a shift of the curve. Firms can adjust vacancies quickly in response to increases in demand, but unemployment tends to adjust more slowly, because it takes time for vacancies to be filled. A rapid cyclical increase in vacancies could move the labor market above its long-run Beveridge curve for a time, and the resulting "Beveridge loop" could be confused for a structural shift. Additionally, empirical Beveridge curves shift in response to any factors that raise unemployment at a given level of vacancies, even if these factors are cyclical in origin. In a depressed labor market, firms may expend less effort when filling their vacancies, and workers may expend less effort when looking for jobs. Cyclical reductions in recruiting and search intensities raise unemployment at any given vacancy level, so that the Beverage curve makes an apparent structural shift to the right. The implication is that a simple plot of vacancies and unemployment is generally insufficient to distinguish cyclical from structural shocks. Additional information—such as independent estimates of mismatch or data from other labor market indicators—is often needed as well.

4.3 Comparing the V/U ratio to the unemployment gap

Normally, analysis of the labor market using the Beveridge curve and V/U ratio is consistent with analysis based on the unemployment gap, defined here to be the difference between the actual unemployment rate and the SPU. The lower panel of figure 2 is a simple Phillips curve diagram that abstracts from any nonlinearities.[12] Recall that the long-run JCC corresponds to a labor market for an economy at potential. The intersection of this JCC with a Beveridge curve (for example, the intersection with BC_0 at point A) should therefore generate an unemployment rate consistent with the FOMC's 2 percent inflation target—that is, an SPU. In the lower panel, this intersection is also denoted U^*_0, indicating that it is the SPU that corresponds to the Beveridge curve BC_0. If a decline in labor demand moves the economy to point B in the upper panel, then in the lower panel the economy moves down the stable short-run Phillips curve PC_0. Both panels would therefore register a cyclical decline in the labor market that puts downward pressure on inflation. The upper panel illustrates the decline with a drop in the V/U ratio relative to the long-run JCC, while the lower panel shows an increase in the unemployment gap $U - U^*$.

The two panels also tell similar stories if an adverse structural shock hits the labor market. If labor demand remains at the long-run JCC, then a rightward shift of the Beveridge curve from BC_0 to BC_1 moves the economy from point A to point C. The SPU rises to U^*_1, and the short-run Phillips curve in the lower panel shifts to the right. Because there has been no change in the labor market's position relative to maximum sustainable employment, there is no change in inflationary pressure. The upper panel illustrates this point with an unchanging V/U

[12] Bundick, Cairo, and Petrosky-Nadeau (2025) and other papers written in support of the 2025 framework review discuss nonlinearities in the Phillips curve or in inflation dynamics more generally.

ratio, while the lower panel shows no change in the unemployment gap, as both the actual unemployment rate and U* have risen by the same amount.

4.4 Using vacancies and the V/U ratio to assess maximum employment

The previous discussion shows that the labor market's distance from maximum sustainable employment can be measured in two ways: as the gap between the unemployment rate and the SPU or the gap between the V/U ratio and the long-run JCC. As a result, predicting inflation using either the unemployment rate or the V/U ratio typically gives similar results. But there are periods when the two methods can differ in practice, most notably when the Beveridge curve shifts. Consider an adverse shift in the Beveridge curve that raises both the actual unemployment rate and U*, with no change in the V/U ratio. If the resulting change in U* is not recognized in real time, then unemployment-based models would erroneously imply that the unemployment gap has increased and inflationary pressure has declined.[13] The two methods may also differ in practice when the V/U ratio is very high. Because the economy is then on the steep portion of a Beveridge curve, changes in labor demand tend to move the V/U ratio by more than they move the unemployment rate, so that the V/U ratio gives a clearer signal of how the distance from maximum employment has changed.

Yet there are challenges to using the V/U ratio to measure maximum employment, particularly over long horizons. The vacancy rate has drifted higher over the past two decades, as has the V/U ratio. These movements suggest that the long-run JCC may have shifted as well. Unfortunately, there is not a well-developed body of research on which to base estimates of the current V/U ratio that is consistent with maximum employment.[14] Of course, estimating an LRU or SPU is also difficult, but the availability of decades of unemployment data has allowed researchers to study different ways to account for demographic trends and other factors that affect long-run unemployment. The relatively short history of official vacancy data from the Bureau of Labor Statistics makes interpreting changes in vacancy trends difficult. Additionally, the response rate in the Job Openings and Labor Turnover Survey (JOLTS), which measures vacancies, was only about 34 percent as of December 2024, increasing the chance of systematic mismeasurement in the official series.[15]

[13] Barnichon and Shapiro (2024) compare the performance of inflation-forecasting models using unemployment to those using the V/U ratio. They argue that the V/U models out-perform models using unemployment, particularly when the Beveridge curve shifts. See also Ball, Leigh, and Mishra (2022).

[14] See Horwich and Mongey (2023) for a discussion of the rising vacancy trend.

[15] Systematic mismeasurement would occur if firms that stop responding to the survey have different patterns of job posting from those that respond, and if these differences could not be corrected by reweighting the reported observations using their observable characteristics.

The relationship between the V/U ratio and labor demand could also be distorted at shorter horizons. In tight labor markets firms may pre-emptively post vacancies because they expect high turnover. If so, then the V/U ratio will overstate the current level of labor demand.[16]

5. The employment-to-population ratio and labor force participation

The EPOP can be helpful in assessing the state of the labor market because it brings in information about the behavior of the LFPR in addition to the unemployment rate.[17] Because cyclical improvements in the LFPR tend to come later in the business cycle compared to the unemployment rate, employment may still not be at its sustainable maximum level even when the unemployment rate is low. Thus, the EPOP is particularly useful in mature expansions, when reductions in labor market slack come relatively less from declines in the unemployment rate and more from cyclical improvements in the LFPR. As a result, it is useful for policymakers to look beyond the unemployment rate when assessing whether there is still slack left in the labor market during mature expansions. Additionally, the EPOP is a useful indicator when there are structural shocks to the LFPR that change the level of maximum employment.

In contrast to the unemployment rate, movements in the LFPR tend to be dominated by nonmonetary structural factors. Those structural factors are important for policymakers to identify, as they are key determinants of the sustainable level of maximum employment. Indeed, the most obvious feature of the LFPR over the past 25 years is its downward trend (see figure 3), which largely reflects the aging of the baby-boom cohort into retirement ages. Other structural factors have also pushed the LFPR up and down over this period—usually slowly but sometimes quickly, such as during the pandemic, as we will discuss in more detail in the next section.[18]

That said, the LFPR also includes a cyclical component, which is related to slack and can be influenced by monetary policy.[19] Research shows that the cyclical component of the LFPR typically lags the unemployment rate.[20] This makes the LFPR less informative than the unemployment rate as a cyclical indicator at the onset of a recession. In fact, declines in the

[16] A modification to the V/U ratio recognizes that most people who take new jobs are not unemployed. They come directly from a previous job or from outside the labor force. So-called generalized measures for job searchers incorporate job-to-job moves as well as movements from nonparticipation to employment. See Abraham, Haltiwanger, and Rendell (2020).

[17] Specifically, $\text{EPOP} = (1 - \text{U}) * \text{LFPR}$,, where U is the unemployment rate.

[18] For a discussion of factors that pushed the EPOP and LFPR of prime-age workers lower for many decades before the pandemic, see Abraham and Kearney (2018) and Board of Governors of the Federal Reserve System (2018). For a discussion on how increases in longevity and health capacity to work have increased and likely pushed up LFPRs of older workers, see Coile, Milligan, and Wise (2016).

[19] To analyze cyclical changes in the LFPR, one must first estimate its structural trend, and many papers have estimated a structural trend and a cyclical component for the LFPR. See, for example, D. Aaronson and others (2014), S. Aaronson and others (2014), Council of Economic Advisers (2014), Montes (2018), Hornstein and Kudlyak (2019).

[20] See Cajner, Coglianese, and Montes (2021) and Cairo, Fujita, and Morales-Jimenez (2022).

EPOP at the onset of a recession are almost entirely driven by increases in the unemployment rate.[21]

Although the LFPR may be less informative as a cyclical indicator in the early part of a business cycle, it can be quite informative in assessing the cyclical position of the labor market in the mature stages of an expansion. As the labor market tightens, declines in the unemployment rate tend to slow. At the same time, reflecting the lags in the LFPR, cyclical increases in the LFPR tend to pick up, as workers who had been previously out of the labor force flow into employment and some workers who might have left the labor force in a less tight labor market stay employed. Thus, employment may still be below its maximum level consistent with price stability during mature expansions when the unemployment rate is already low, with increases in employment coming more from cyclical improvements in the LFPR and less from further large declines in the unemployment rate.

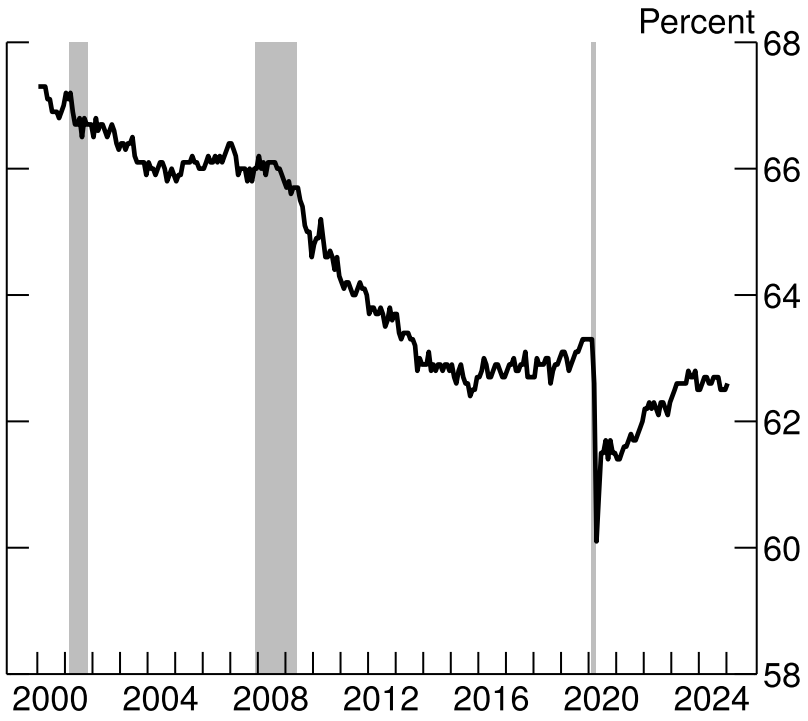
Long expansions and labor markets that are persistently near maximum employment allow time for the slow cyclical dynamics of the LFPR to play out and can provide conditions that draw workers into the labor market on a permanent basis, especially Black workers, less-educated workers, and younger workers whose participation rates tend to recover later in the cycle and by larger amounts than other groups.[22] Those dynamics suggest that, in long expansions, the aggregate EPOP is a more broad-based and inclusive indicator than the aggregate unemployment rate. Further, tight labor markets can generate "reverse hysteresis" and boost the long-run structural LFPR, which may change the benchmark for what constitutes maximum employment, shifting that level upward.[23]

[21] The LFPRs of Black workers, less-educated workers, and younger workers decline more quickly and by a larger amount during a recession. If looking to the LFPR for evidence of a cyclical decline, it may be more helpful to focus on changes in the LFPRs of these groups rather than the overall LFPR.

[22] See, for example, Aaronson and others (2019) and Cajner, Coglianese, and Montes (2021).

[23] Broadly defined, reverse hysteresis in the labor market describes when strong labor market conditions have long and lasting positive effects on a worker's labor market experience. See, for example, Aaronson and others (2019) and Hotchkiss and Moore (2022).

Figure 3. Labor force participation rate, ages 16 and older



Source: U.S. Bureau of Labor Statistics

6. Other indicators

In addition to the measures we focus on, there are other indicators that can add complementary insights into the assessment of labor market slack.

- Nominal wage growth generally reflects the relative strength of labor demand and supply, as well as trend inflation. Higher nominal wage growth, all else being equal, is consistent with a tighter labor market and implies that the labor market is closer to maximum employment. However, whether higher wage growth translates to higher inflation in the short term depends on the underlying drivers of wage growth. For instance, wage growth driven by productivity growth is generally not inflationary, whereas higher wage growth resulting from higher worker bargaining power (without productivity gains) can contribute to inflationary pressures.[24] That being said, existing empirical studies generally find that unit labor costs—labor compensation adjusted for labor productivity—have limited usefulness in forecasting inflation.[25]

[24] In the late 1990s, wage growth accelerated in tandem with productivity growth, while inflation remained subdued.

[25] See, for example, Peneva and Rudd (2015) and Barlevy and Hu (2023). Crump and others (2024) and Blanchard and Bernanke (2023) specify more explicitly the interactions between wage growth, inflation, and inflation expectations, while also controlling for supply-side factors, and conclude that labor market conditions played a limited role in the 2021-2022 inflation surge.

- Gross worker flows constructed from the public-use micro data of the CPS can provide additional information beyond the behavior of stock variables like the unemployment rate and the LFPR. For example, the transition rate from unemployment to employment—often called the job-finding rate—provides information not only about the current pace of exits from the unemployment pool, but also about labor market matching efficiency, calculated as the variation in the job-finding rate not accounted for by movements in the V/U ratio.[26] The transition rate from employment to unemployment serves as a measure of job losses that has proven to be cyclically sensitive in previous downturns.[27]
- The JOLTS provides alternative flow measures, derived from a survey of establishments. For example, hires per vacancy, known as the job-filling rate, measures how quickly firms are filling open positions in each month. The quits rate, which tracks worker-initiated separations, reflects workers' confidence in the ability to find a new job. Notably, a lower job-filling rate and a higher quits rate preceded an acceleration in wage growth in 2021 and 2022.[28]

7. Assessing maximum employment during and after the Global Financial Crisis and COVID-19 pandemic

This section describes how the indicators previously discussed characterized the progress of the labor market toward maximum sustainable employment around the GFC and the COVID-19 pandemic. The unemployment rate captured most of the cyclical movements in the labor market in both episodes. The LFPR also played an important role in both eras, but for different reasons. During and after the GFC, the LFPR responded slowly to changes in labor demand, in line with its normal cyclical behavior. Consequently, during the ensuing recovery, the EPOP approached maximum employment slowly as well. During the pandemic, however, abrupt behavioral changes in labor supply, manifested in the LFPR, indicated that the level of maximum sustainable employment was lower than before the pandemic. In both the GFC and the pandemic, the V/U ratio and the Beveridge curve helped assess the relative importance of supply- and demand-side shocks to the labor market.

[26] See Sahin and others (2014), Barnichon and Figura (2015), and Ahn and Crane (2020).

[27] See Fujita and Ramey (2009) and Elsby, Michaels, and Solon (2009). Other measures of job loss distinguish between permanent and temporary layoffs (Fujita and Moscarini, 2017 and Hall and Kudlyak, 2022) or include layoffs resulting in labor force exit (Ellieroth and Michaud, 2024). UI initial claims are a weekly administrative measure of layoffs but is based on a selected sample of UI claimants.

[28] Recent research shows that the quits rate (or the job-to-job transition rate) is a powerful predictor of wage growth. See Faberman and Justiniano (2015), Moscarini and Postel-Vinay (2023), Faccini and Melosi (2023), and Heise, Pearce, and Weber (2024).

7.1 Global Financial Crisis

Rapidly worsening strains in financial markets coincided with a severe deterioration of labor market conditions in 2008 and 2009. As seen in figures 1, 4, and 5, the unemployment rate rose sharply during these two years, while vacancies and the V/U ratio declined. Movements in unemployment and vacancy rates trace out the black circles in a Beveridge diagram (see figure 6), with falling vacancies and rising unemployment indicating a significant drop in labor demand.

By late 2009, with labor demand recovering, the unemployment rate began to fall and the vacancy rate began to rise. The red squares in the Beveridge diagram show that the Beveridge curve appears to shift out around this time, a movement that is consistent with research showing an increase in mismatch during this period. Workers from manufacturing and construction were disproportionately displaced during the GFC, and many of these workers probably lacked the skills to move into other industries.[29] By 2019, however, the economy appears to be close to its previous Beveridge curve, consistent with estimates that mismatch had declined by mid-decade.[30] Unemployment also reached very low levels by 2019, although, even in this strong economy, the labor market never appeared to be on a steep portion of the Beveridge curve.

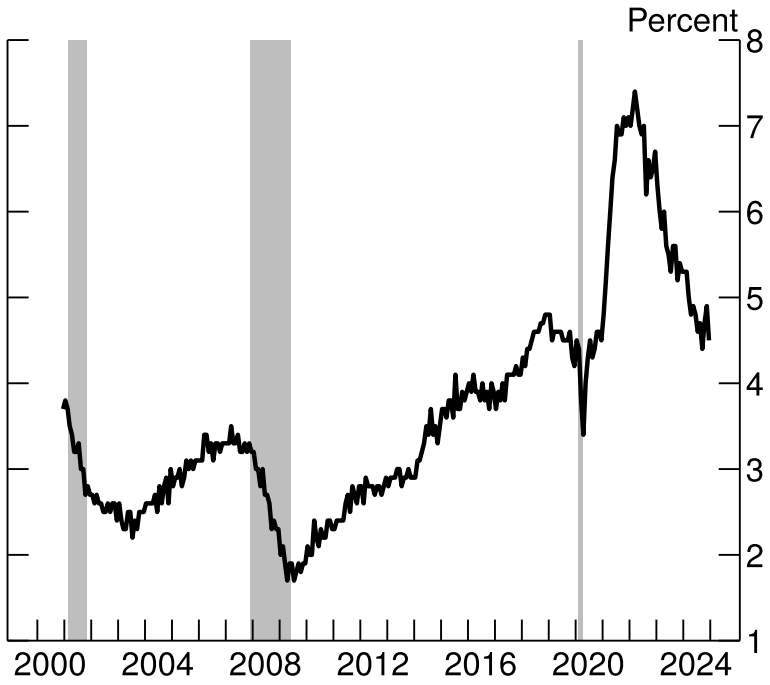
The GFC and its aftermath provide a good example of how labor force participation traditionally responds to changing cyclical conditions. The decline-and-recovery pattern of participation is best highlighted by focusing on the participation of so-called prime-age persons, aged 25 to 54, because this group's LFPR is not affected significantly by aging trends (see figure 7). Participation decisions tend to respond slowly to changes in economic conditions, and, indeed, the prime-age LFPR continued to decline well after the GFC officially ended. It started to recover in 2015, as the unemployment rate and V/U ratio approached their pre-recession levels. Consistent with the long lags in the LFPR, the prime-age LFPR neared its pre-GFC level only in 2019, eventually reaching a cyclically strong outcome. The recovery of participation among prime-age women and prime-age Black workers, for example, was particularly robust during the second half of the 2010s.

The combination of low unemployment and benign inflation during the late 2010s suggests that robust labor markets need not always generate inflationary pressure. Late in an expansion, employment may remain below the maximum sustainable level consistent with price stability because the LFPR has yet to recover fully. It is therefore important to look beyond the unemployment rate when assessing whether slack remains in the labor market. Additionally, the tight labor market of the late 2010s could have led to reverse hysteresis, which would have raised structural participation rates and thereby increased the maximum level of employment consistent with price stability.

[29] Sahin and others (2014) argue that mismatch across industries and occupations was important during and after the GFC.

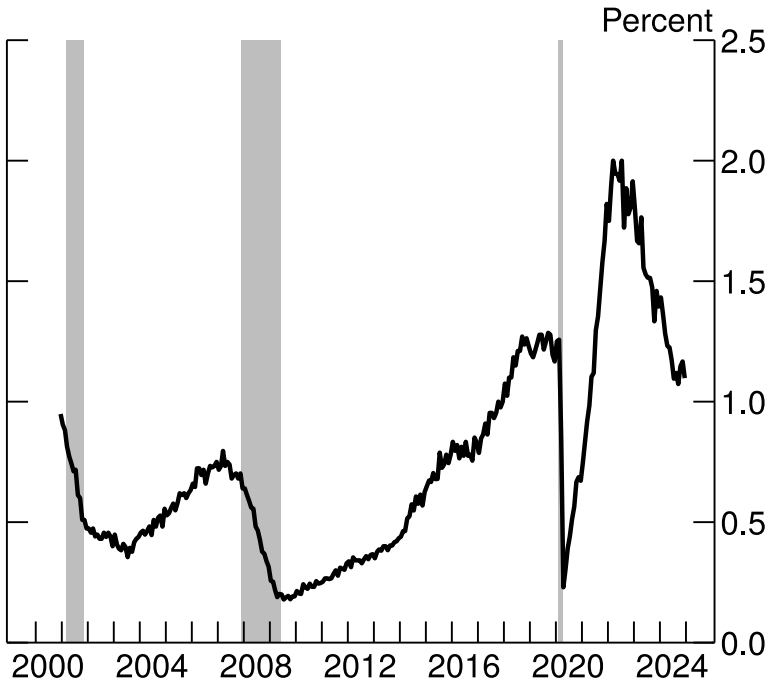
[30] For estimates of mismatch over the past several decades, see Barlevy and others (2024).

Figure 4. Job vacancy rate



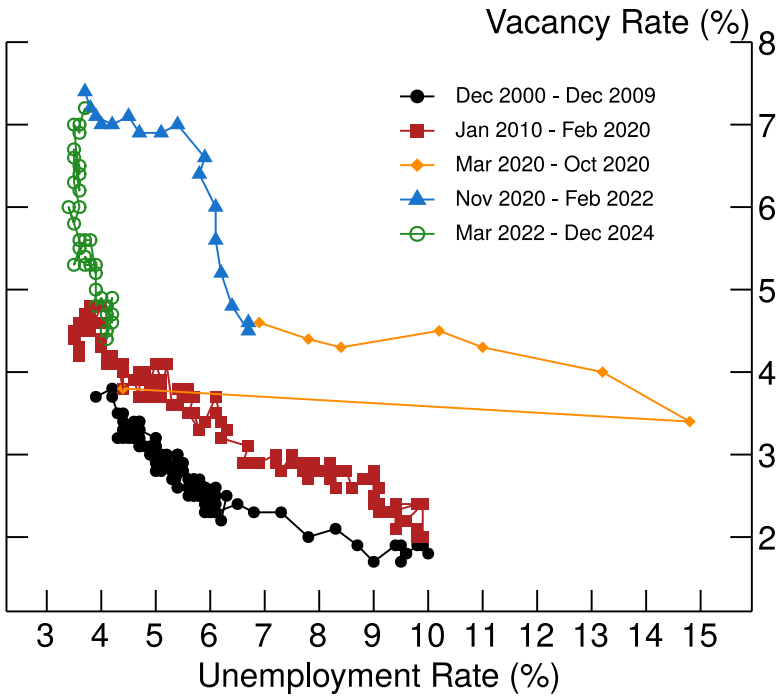
Source: U.S. Bureau of Labor Statistics

Figure 5. The vacancy-unemployment ratio



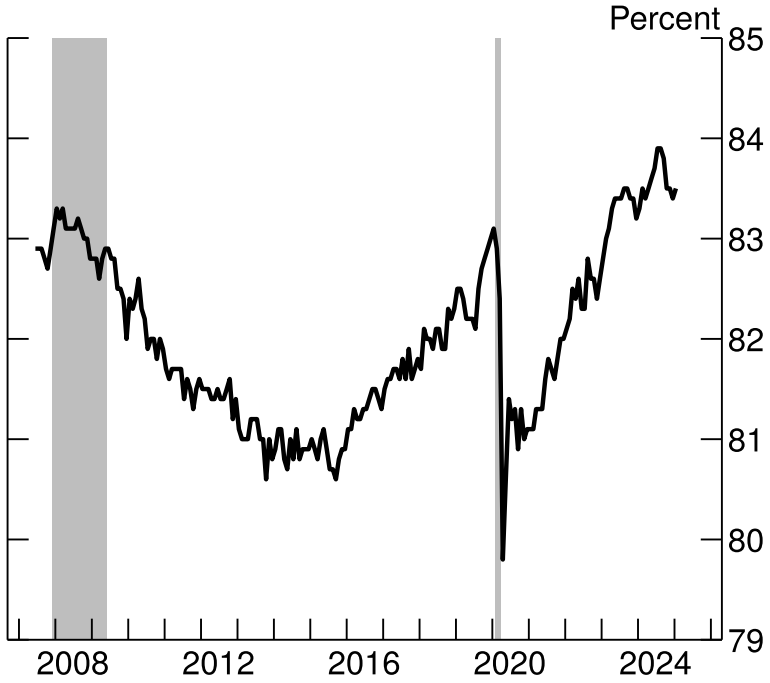
Source: U.S. Bureau of Labor Statistics, Federal Reserve staff calculations

Figure 6. The Beveridge diagram



Source: U.S. Bureau of Labor Statistics, Federal Reserve staff calculations

Figure 7. Labor force participation rate, ages 25 to 54



Source: U.S. Bureau of Labor Statistics

7.2 Early Pandemic: March 2020 to October 2020

During the first two months of the pandemic, the unemployment rate rose sharply to a multi-decade high. The initial decline in the vacancy rate was small relative to the outsized increase in unemployment, so there was a large movement to the right in the Beveridge diagram, as shown by the orange diamonds in figure 6. Yet the Beveridge curve—which is influenced by *long-run* changes in layoffs—did not shift out to the same degree, due to the temporary nature of the job losses. Indeed, as workers were recalled throughout mid-2020, the unemployment rate fell rapidly, causing a movement in the Beveridge diagram back toward the pre-pandemic data.

The sharp and sudden decline of the LFPR at the start of the pandemic was unique compared to other recessions (figure 3), because it reflected mostly supply-side factors, rather than changes in demand. Persons who had to quarantine after becoming infected were forced out of the labor force for a time. Fears of contracting the virus also reduced the willingness to work among some people and likely contributed to increased retirements among persons aged 65 and older.[31] School closures weighed on participation among women with young children.[32] All told, over 2020, the LFPR saw its largest 12-month decline in the post-war period, falling roughly 2 percentage points, representing nearly 5 million people. Because the factors that had reduced the LFPR were supply-driven, they temporarily lowered the maximum level of

[31] See Montes, Smith, and Dajon (2022) for an in-depth analysis of pandemic retirements.

[32] See, for example, Heggeness (2020); Lofton, Petrosky-Nadeau, and Seitelman (2021); Montes, Smith, and Leigh (2021); and Lim and Zabek (2024).

employment consistent with price stability. The supply-driven nature of the LFPR movements also meant that monetary policy had little ability to affect the LFPR over this period.

7.3 Late Pandemic: November 2020 to February 2022

During the first half of 2021, vacancies began recovering rapidly, but increases in labor demand were not matched by higher labor supply. Many of the factors that had reduced labor supply were beginning to unwind, but progress was slow. The effect of school closures on participation among mothers abated in 2021, helping spur the recovery of employment and participation among prime-age women. Yet the recovery in participation was repeatedly stalled with each new wave of the pandemic through early 2022. Additionally, a significant portion of the large federal transfers to households were saved, which may have reduced incentives to work.

By the first half of 2021, the data suggest that the Beveridge curve had shifted out relative to its pre-pandemic position. Some researchers have interpreted the blue triangles in the Beveridge diagram as moving up a new Beveridge curve; the position of this curve implies that the SPU was higher and the level of maximum employment was lower than before the pandemic. In July 2021, the unemployment rate was 5.4 percent, much higher than the pre-pandemic rate of 3.5 percent. But because of the Beveridge curve shift, the 5.4 percent unemployment rate was likely close to the SPU at the time, indicating a tight labor market.

An outward shift in the Beveridge curve in the first half of 2021 is consistent with other signs that labor re-allocation was increasing. The JOLTS quits rate rose from 2.3 percent of employment in January 2021 to 2.9 percent in December. Analysis of household data suggests that the higher quits rate was due to workers leaving the labor force as well as transitioning into new jobs.[33] Both sources of quits could result in a large increase in job openings for a given unemployment rate and, thus, have contributed to an outward shift in the Beveridge curve.[34]

In the second half of 2021, the unemployment rate fell sharply, from 5.9 percent in June to 3.9 percent in December. Vacancies, however, were relatively stable. These movements are consistent with a reduction in labor market frictions toward more-normal levels, which shifted the Beveridge curve back toward its pre-pandemic position. This movement coincided with continued increases in labor demand that rotated the V/U ratio up. A leftward Beveridge curve shift and a higher V/U ratio both tend to reduce unemployment, which explains the 2-percentage-point drop during the last half of 2021. Because the V/U ratio was rising, this unemployment decline was larger than the drop in the SPU, so both the V/U ratio and the unemployment gap

[33] See Fujita, Moscarini, and Postel-Vinay (2024) for the employer-to-employer transition rate and Ellieroth and Michaud (2024) for the quits rate into nonemployment.

[34] Note that more job-to-job transitions *per se* do not imply higher vacancies on net, as workers who quit fill other open positions. However, greater job search activities increase the value of posting a vacancy and thus incentivize job creation. In contrast, quits into nonparticipation directly increase vacancies. Both types of transitions result in a phenomenon called vacancy chains (Akerlof, Rose, and Yellen, 1988).

were signaling that the labor market was moving past maximum sustainable employment in late 2021.

7.4 Moving to Restrictive Monetary Policy: March 2022 to December 2024

By March 2022—the month that the FOMC began raising the target range for the federal funds rate—the unemployment rate had fallen to 3.7 percent, near its pre-pandemic level. But the V/U ratio indicated that there were about 2 job openings for every unemployed worker, the highest number since JOLTS data became available in December 2000 and nearly double the 1.2 openings per unemployed worker recorded in February 2020.

As interest rates began to rise amid record-high vacancies, a natural question was whether labor market tightness could ease significantly without a substantial increase in unemployment.[35] The green circles in figure 6 show that the unemployment rate did in fact remain relatively stable, rising by less than 1 percentage point after mid-2022, as the vacancy rate normalized and the layoff rate remained low. Although other interpretations are possible, this pattern of rebalancing is consistent with a downward movement along a steep Beveridge curve.[36] The decline in labor demand had smaller-than-normal effects on job-finding and layoff rates, because the economy was moving from a position of severe labor shortages to one in which labor supply and labor demand were in better balance. A related implication of having been on the steep portion of the Beveridge curve was that the V/U ratio gave a clearer indication of the progress back toward maximum employment than the unemployment rate did during this period. At the same time, the LFPR continued to recover from its initial pandemic decline, reversing the temporary reduction in maximum sustainable employment and aiding the rebalancing of the labor market. Increases in immigration also boosted labor supply over this period.

8. Concluding remarks

Accurate assessment of labor market conditions is essential for informing monetary policy as the Federal Reserve pursues its dual mandate of maximum employment and stable prices. It is also a difficult task. Although a wider range of indicators can be used, this paper highlights a core set that is particularly informative for discussions about maximum employment and labor market slack. Our main conclusions are the following:

- The unemployment rate is the key indicator of the cyclical position of the labor market. It is highly correlated with other indicators, and it has practical advantages.
- Job vacancies and an analysis of the Beveridge curve help to distinguish movements in unemployment that are driven by aggregate demand versus movements that result

[35] See, for example, Figura and Waller (2022) and Benigno and Eggertsson (2024).

[36] Another interpretation is that the Beveridge curve was not particularly steep in early 2022, but that it continued to shift back even after March 2022. However, separate estimates of matching efficiency suggest that the Beveridge curve remained relatively stable after early 2022.

from structural, supply-side forces. Additionally, job vacancies are more responsive than the unemployment rate to changes in slack when the labor market is very tight.

- The EPOP and LPFR are particularly useful indicators in mature business cycles, when reductions in labor market slack tend to come less from reductions in the unemployment rate and more from cyclical improvements in the LFPR, particularly for some socioeconomic groups. Sharp movements in the LFPR also help identify shocks to labor supply.

The past decade has also seen a rapid expansion of alternative labor market data from a variety of sources. These indicators are likely to enhance our real-time assessment of maximum employment by providing timely, additional insights into the underlying drivers of the labor market.

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