GETTING GLOBAL MONETARY POLICY ON TRACK

EDITED BY

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EMPLOYMENT DYNAMICS, LABOR MARKETS, THE PHILLIPS CURVE, AND INFLATION

INTRODUCTORY REMARKS

Valerie Ramey

Welcome to the session. My name is Valerie Ramey, and I'm a senior fellow here at the Hoover Institution. This session is on employment dynamics, labor markets, Phillips curves, and inflation. Of course, in any monetary conference, understanding the condition of the labor market takes center stage, not only because of the dual mandate but also because of the Phillips curve relationship between the state of the labor market and inflation, even though the stability of such a relationship has become a will-o'-the-wisp of our profession. Our three speakers today are Steve Davis, who's also a senior fellow at the Hoover Institution; Marianna Kudlyak, who is a research economist at the Federal Reserve Bank of San Francisco; and Emi Nakamura, who is a chancellor's professor at the University of California–Berkeley (whose paper has not been included in this volume).

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Extraordinary Labor Market Developments and the 2022–23 Disinflation

Steven J. Davis

Two extraordinary US labor market developments facilitated the sharp disinflation in 2022–23 without raising the unemployment rate. First, pandemic-driven infection worries and social-distancing intentions caused a sizable drag on labor force participation that began to reverse in the first quarter of 2022, and perhaps earlier. As the reversal unfolded, it raised labor supply and reduced wage growth. Second, the pandemic-instigated shift to work from home (WFH) raised the amenity value of employment in many jobs and for many workers. This development lowered wage-growth pressures along the transition path to a new equilibrium with pay packages that recognized higher remote work levels and their benefits to workers. Surveys of business executives imply that the shift to WFH lowered average wage growth by two percentage points from spring 2021 to spring 2023. A direct inspection finds that average real wage growth from 2021 Q1 to 2024 Q1 in the US economy was at least 3.5 to 4.4 percentage points (ppts) below the path suggested by pre-pandemic experience. This large shortfall in real wage growth aligns well with the interpretation of the 2022–23 disinflation offered here.

* * *

Earlier in this conference, Yuriy Gorodnichenko (see chapter 4) made some important observations about the recent disinflation

in Europe and the United States. Three of his observations set the stage for my remarks:

1. Disinflation was surprisingly rapid. As measured by the one-year change in the US Consumer Price Index (CPI), for example, the inflation rate fell nearly six percentage points from June 2022 to June 2023 and by 5.3 ppts from July 2022 to December 2023.[1]
2. This disinflation episode looks nothing like a movement along a Phillips curve. Instead, the inflation rate fell sharply with essentially no change in the unemployment rate.
3. It's implausible to credit the recent disinflation mainly to monetary policy, because inflation fell too early relative to the timing of policy tightening.

The recent tightening cycle began with a modest 25-basis-point hike in the target fed funds rate in March 2022. Six more hikes from May to December brought a cumulative policy rate hike of 425 basis points, mostly in the second half of 2022.[2] Since monetary policy typically operates with "long and variable lags," it's hard to see how the recent tightening explains the abrupt fall in inflation.[3]

These observations call for explanation. In this regard, Gorodnichenko highlights the role of energy and commodity market developments, which played an important role in Europe but a more modest one in the United States. The unwinding of pandemic-related disruptions in global supply chains also contributed to the recent disinflation. See Comin, Johnson, and Jones (2023), for example.

I will advance a different and complementary explanation for the recent disinflation that centers on two extraordinary labor market developments associated with the pandemic and its aftermath. The first is the sizable labor force withdrawal in 2020 and 2021, driven by infection worries and social distancing, followed by recovery in participation rates as infection worries and social distancing receded. The second development is the big and lasting shift to work from home.[4] I focus on the United States, for which I can offer better

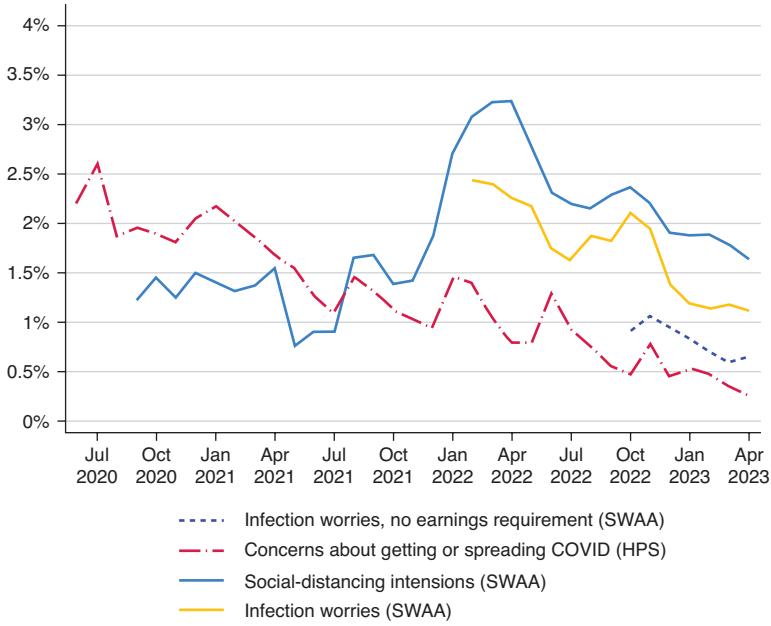

FIGURE 15.1. Estimated labor force drag from social distancing and infection worries, June 2020 to April 2023, in percentage points.

Source: Reproduced from figure 5 in Barrero, Bloom, and Davis (2023b), based on their analysis of microdata from the monthly Survey of Working Arrangements and Attitudes (SWAA) and the Census Bureau's monthly Household Pulse Survey (HPS).

evidence. The second extraordinary development—and perhaps the first as well—is more pronounced in the United States than in Europe, with the possible exception of the United Kingdom.

Labor Force Withdrawal and Return

Figure 15.1 presents several estimates for the effects of infection worries and social-distancing behaviors on the US labor force participation rate from June 2020 to April 2023. There are four distinct time series, each of which reflects a different estimation method or data source, as sketched below. The interested reader can consult Barrero, Bloom, and Davis (2023b) for details.

The solid blue line reflects a regression model that relates individual-level labor force status as of the survey reference week to the individual's stated social-distancing intentions in the US Survey of Working Arrangements and Attitudes (SWAA) (Barrero, Bloom, and Davis 2021). Specifically, we combine the fitted regression model with a scenario that "turns off" voluntary social distancing to obtain the solid blue line. The peak implied negative effect of social distancing on labor force participation was about three percentage points. The identifying assumption here is that stated social-distancing intentions are exogenous, conditional on the other covariates in the regression model.

The other three curves in figure 15.1 rely on an entirely different approach. Specifically, when the respondent is outside the labor force during the survey reference week, we ask why. We then count respondents who attribute their nonparticipation status to infection worries and express the count as a percentage of the relevant population. Thus, this second approach relies on self-assessed causal explanations of a respondent's own labor force status. Here, the identification assumption is that the survey questions elicit accurate explanations for the respondent's own behavior. We implemented this second approach using three question designs fielded across two independent surveys—one that we run and one that the US Census Bureau runs.

The four series in figure 15.1 differ in the estimated drag on labor force participation. However, all four series suggest a material drag on participation rates. In addition, the various estimates point to a reversal of the labor force drag since the first quarter of 2022 or earlier. That reversal raised labor supply and put downward pressure on wages.

Figure 15.2 presents estimates of the labor force drag associated with social distancing and infection worries by demographic group as of 2022. The estimates plotted on the vertical scale reflect

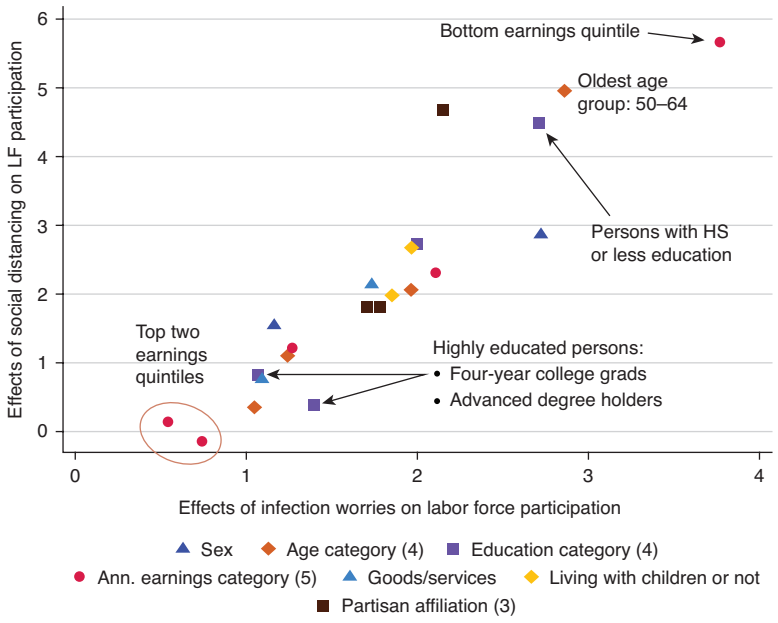

FIGURE 15.2. Estimates of labor force drag by group, February 2022 to January 2023.

Source: Reproduced from figure A.5 in Barrero, Bloom, and Davis (2023b).

the regression approach, while the ones on the horizontal scale reflect self-assessed causal effects. While the two approaches yield different-level estimates for the labor force drag, as in figure 15.1, the between-group patterns are—reassuringly—quite similar.

According to figure 15.2, the labor force withdrawal associated with social distancing and infection worries is very much concentrated in the lower parts of the earnings distribution, among the least educated, and among persons 50–64 years of age. For people in the top two earnings quintiles, the estimated drag on labor force participation is essentially zero according to the regression approach and modest (half to three-quarters of a percentage point) according to self-assessed causal effects.

The Effects on Wages and Inflationary Pressures

Thus far I have shown evidence that pandemic-driven infection worries and social-distancing intentions caused a sizable drag on labor force participation that began to reverse in the first quarter of 2022, and perhaps earlier. Barrero, Bloom, and Davis (2023b) do not assess the effects of this labor force withdrawal and return on overall wage growth. Instead, they feed their estimates for the labor supply effects of social-distancing intentions into a competitive equilibrium model with a stable production technology. In this way, they use the model to quantify the effects of social distancing on the education and experience structure of relative wages. They draw on previous research to set parameter values for the elasticity of substitution between college and noncollege workers and across age-experience groups within the education categories.

Figure 15.3 displays the resulting model-implied estimates of how social-distancing effects on labor supply affected the wage structure in 2022 relative to a counterfactual with no social distancing. The wage effects are sizable, especially for noncollege workers, and they rise with age. As Barrero, Bloom, and Davis (2023b) discuss, these patterns align well with the observation that older and less-educated workers had stronger health-related reasons to engage in social-distancing behaviors. Less-educated workers also had fewer options to continue working while engaging in social-distancing behaviors.

For the argument in this essay, figures 15.1 to 15.3 yield the following messages. First, social distancing added to wage-growth pressures in the wake of the pandemic, especially in the lower rungs of the earnings distribution and for jobs filled by less-educated workers. Second, the reversal of this process restrained wage growth in 2022 and 2023. Again, these effects were concentrated among those with less education and lower pay. Third, the timing of the reversal was fortuitous for the Federal Reserve, as it roughly coincided with its efforts to cut the inflation rate.

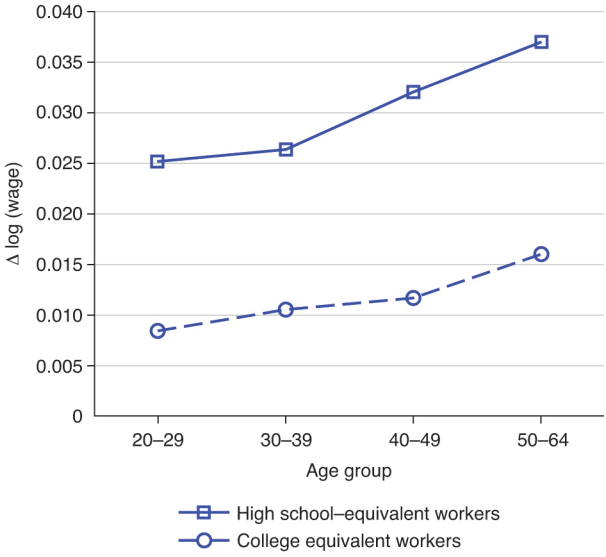

FIGURE 15.3. Estimated social-distancing effects on the wage structure as of 2022. Source: Reproduced from figure 6 in Barrero, Bloom, and Davis (2023b). They combine the estimated labor supply effects of social-distancing intentions by age–education group with the competitive equilibrium model of Card and Lemieux (2001) to obtain the estimated social-distancing effects on the wage structure.

The Big Shift to Work from Home

The COVID-19 pandemic instigated a big, lasting shift in working arrangements. Figure 15.4 quantifies this shift in terms of full paid workdays performed at home. As the figure indicates, the work-from-home rate as of early 2024 is about four times the rate that prevailed in 2019. This big shift in how we work has had surprisingly benign (or even positive) effects on productivity. That's a major reason the shift has endured. See Barrero, Bloom, and Davis (2023a) for a review of evidence on the productivity effects of the shift to WFH. My remarks here will focus on the amenity-value gains associated with the shift to WFH and the implications for wages and inflation.

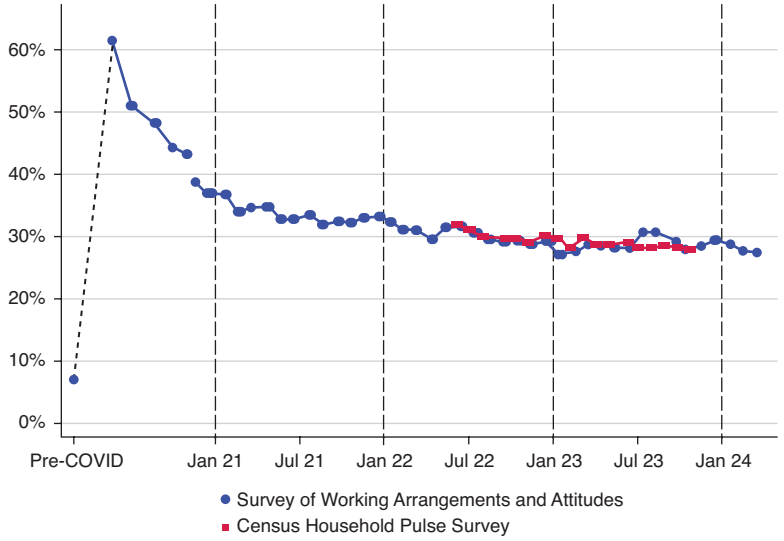

FIGURE 15.4. Work from home, in percentage of full paid workdays, over time in the United States, 2019 (pre-COVID) to March 2024.

Source: Samples restricted to working persons, 20–64, with annualized earnings greater than $10K. The pre-COVID percentage relies on data from the Bureau of Labor Statistics, 2019 American Time Use Survey. Monthly updates of this chart are available at WFH Research, https://www.wfhresearch.com.

Most workers like to work from home for at least part of the workweek, because doing so saves on the money and time costs of commuting (about sixty-five minutes per day, on average, for American workers), improves flexibility in time use over the workday and workweek, increases personal autonomy, and relaxes residential location choices. For some people, WFH also complements caregiving activities at, or near, home such as caring for an ailing parent or partner.

When asked directly via surveys, as in Barrero, Bloom, and Davis (2021), most American workers prefer to WFH part of the week. The mean stated value of the option to WFH two or three days a week is about 8% of pay in the SWAA. That's large, and it's consistent with evidence from field experiments for particular groups of

workers. However, it's also important to recognize that preferences over working arrangements differ widely in the cross section. Some people dislike WFH and require extra compensation to do so willingly. Others are nearly indifferent between WFH and working at the employer's site. The rest, a majority, differ widely in their willingness to pay for the opportunity to WFH part of the week. For present purposes, the key point is that some WFH is a valued job amenity for most American workers. It follows that the big shift to WFH raised the amenity value of employment in many jobs for many workers.

Reduced Wage-Growth Pressures on the Transition Path

Economic reasoning implies that employers and workers ultimately share the amenity-value gains associated with the big shift to WFH.[5] Since workers initially reaped the direct benefits of the shift at predetermined wages—i.e., wages set before the pandemic struck—employer benefits take the form of slower wage growth along the transition path to a new equilibrium with pay packages that recognize higher remote work levels.

Barrero et al. (2022) developed survey evidence to assess this mechanism and quantify its force. To do so, they put questions to hundreds of US business executives in the Survey of Business Uncertainty, fielded by the Federal Reserve Bank of Atlanta. About four in ten executives said their firms relied on expanded WFH to moderate wage-growth pressures when looking back twelve months from April/May 2022. A similar share of executives (as of April/May 2022) said that their firms expected to rely on WFH to moderate wage growth over the next twelve months. When executives said that expanded WFH opportunities moderated wage growth (or would do so) at their firm, the survey asked how much. Integrating overall firm-level responses, and weighting each firm in proportion to its employment level, Barrero et al. (2022) found

that the big shift to WFH reduced overall wage growth by about two percentage points over two years centered on April/May 2022.

The shift to remote work affects labor costs in other ways as well. Barrero et al. (2022) presented evidence that increased reliance on remote work at the firm level is associated with more use of independent contractors, leased employees, domestic outsourcing, and foreign offshoring. These developments are also likely to reduce labor costs. In addition, fully remote employees do not require office space and the overhead costs that come with a physical footprint. To a lesser extent, hybrid working arrangements also let firms economize on space.

These employer cost savings need not come at the expense of their employees. WFH yields benefits that most workers appreciate and that some value greatly. Moreover, the relaxation of locational constraints afforded by WFH can simultaneously raise real worker wages and lower real product wages. To see this point, consider an employee who accepts a 10% nominal wage cut in exchange for performing his job remotely and relocating to another city with living costs that are 20% lower. In this example, the employee's real wage rises by about 10% and the employer's real cost of securing his labor services falls by 10%. Both employer and employee benefit.

Sluggish Real Wage Growth since Early 2021

To summarize, two extraordinary labor market developments exerted unusual restraints on wage growth (and other labor-related costs) in recent years. First, a rebound in the labor force participation rate raised labor supply and restrained wage growth starting in the first quarter of 2022, and perhaps earlier. Second, the big shift to WFH lowered average wage growth by two percentage points from spring 2021 to spring 2023. The shift to WFH likely exerted downward pressure on wage growth outside of this time interval as well, given that wage adjustments take time. Even with flexible

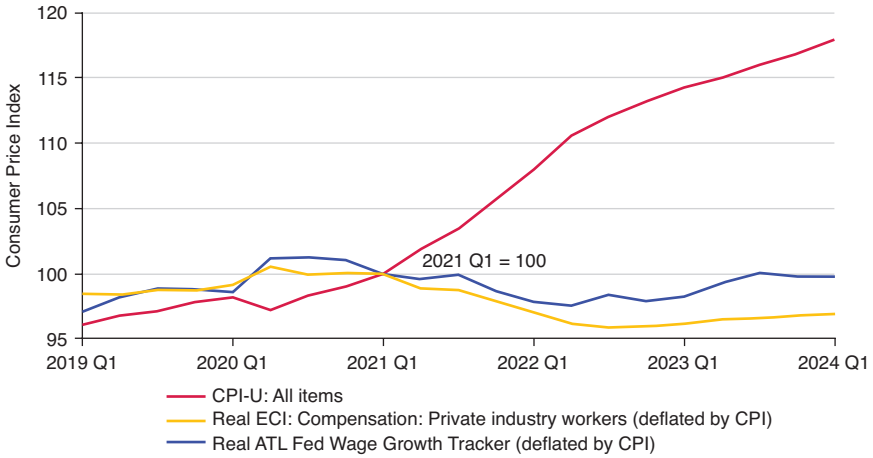

FIGURE 15.5. US real wage behavior and the Consumer Price Index, 2019 Q1 to 2024 Q1. All series are normalized to a value of 100 in 2021 Q1.

Source: Author's calculations based on data from the Bureau of Labor Statistics and the Atlanta Fed.

wages, search and matching frictions in the labor market imply that it takes time for people who value WFH to sort into jobs that offer the amenity. That, too, slows the aggregate wage-adjustment process, as in the analysis of Bagga et al. (2023).

If this line of argument is correct, we should see unusually slow growth in aggregate real wages from the first quarter of 2021 through at least the middle of 2023. We should also see persistent shifts in the structure of real wages, with greater wage-growth restraint in sectors that offer more scope for remote work. I now take up these two matters in turn.

Figure 15.5 plots the US Consumer Price Index and two real wage measures from 2019 Q1 through 2024 Q1. All series are normalized to a value of 100 in 2021 Q1. I use the Employment Cost Index (ECI) and the Atlanta Fed Wage Growth Tracker to measure average wages. The ECI aims to control for changes in the mix of jobs over time, and the Wage Tracker aims to control for changes in the

mix of workers. Other leading wage indexes do not control for compositional shifts, which makes them less suitable for my purposes.[6]

The deflated Wage Tracker series fell 0.2 ppts from 2021 Q1 through 2024 Q1, and the deflated ECI fell 3.3 ppts. Just how unusual is this real wage behavior? As a point of reference, consider the period from 2006 to 2019. The deflated ECI rose by an average of 0.4 ppts per year over this period, and the deflated Wage Tracker rose by 1.1 ppts per year. Both real wage measures moved in a procyclical manner during this period. In light of this history, and taking note of the very tight US labor markets since 2021, it's reasonable to expect cumulative real wage growth from 2021 Q1 to 2024 Q1 of *at least* 1.3 ppts according to the deflated ECI and 3.3 ppts according to the deflated Wage Tracker. We saw nothing like that. Indeed, average real wages are down 3.5 to 4.4 ppts in the period from 2021 Q1 to 2024 Q1 relative to what's expected from history. That's a huge shortfall in real wage growth, and it aligns with my interpretation of the recent disinflation.[7]

Figure 15.6 displays the deflated ECI by major industry sector at a quarterly frequency from 2019 Q1 to 2024 Q1. As before, each series is indexed to 100 in 2021 Q1. Industry-level wage-growth differences over this period are broadly in line with the amenity-value interpretation of sluggish real wage growth sketched above.[8] The Leisure & Hospitality sector exhibits the strongest wage growth from 2021 Q1 to 2024 Q1. There are few WFH opportunities in this sector and, hence, there is little scope for amenity-value gains to restrain wage growth. Retail Trade, Healthcare & Social Assistance, and Other Services also show relatively strong wage growth since 2021 Q1. These sectors also offer limited scope to work from home. At the bottom of the ECI wage-growth distribution is Finance & Insurance, with a drop of more than 8% from 2021 Q1 to 2024 Q1. This sector has among the highest WFH rates in the economy and much scope for amenity-value

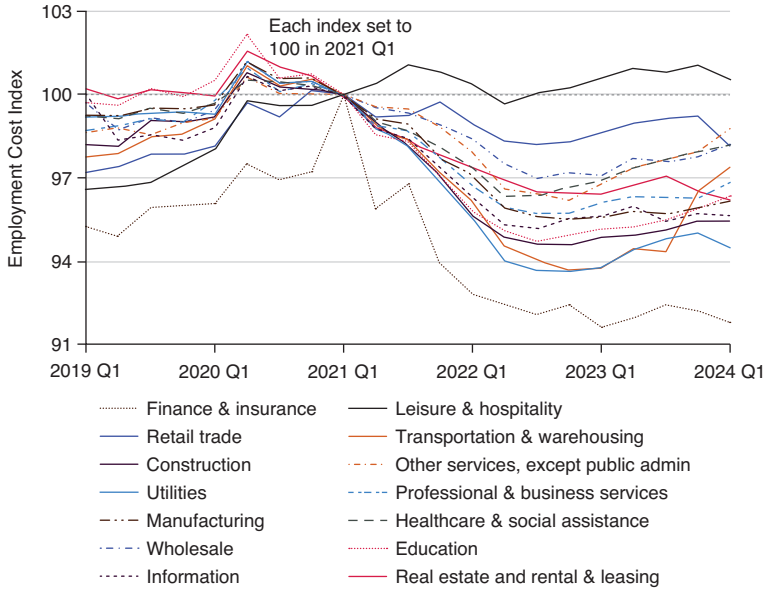

FIGURE 15.6. ECI by industry, deflated by the CPI, 2019 Q1 to 2024 Q1.
Source: Author's calculations based on data from the Bureau of Labor Statistics.

gains to restrain wage growth. However, two other sectors with high WFH rates—Information and Professional & Business Services—had wage growth from 2021 Q1 to 2024 Q1 that place them near the middle of the ECI wage-growth distribution. And the Construction sector, which offers limited WFH opportunities, experienced relatively slow wage growth from 2021 Q1 to 2024 Q1. Clearly, the amenity-value story does not fully explain the distribution of industry-level wage changes since early 2021.

Concluding Remarks

This essay presents evidence that two extraordinary labor market developments exerted unusual restraints on wage growth (and other labor-related costs) in recent years. First, a rebound in the labor force

participation rate raised labor supply and restrained wage growth starting in the first quarter of 2022, and perhaps earlier. Second, the big shift to WFH lowered average wage growth by two percentage points from spring 2021 to spring 2023, and it likely exerted downward pressure on wage growth outside of this time interval as well.

These developments came at a fortuitous time for the Fed, as it sought to bring inflation back to acceptable levels with a series of policy rate hikes that began in March 2022. By exerting downward pressure on wages and other labor-related costs, these developments eased the way for a sharp reduction in inflation with no rise in unemployment—even before the effects of monetary policy tightening added to the disinflationary pressures.

My interpretation of the recent disinflation implies a period of unusually sluggish real wage growth as these labor market developments played out. In this respect, I show that average real wages were down 3.5 to 4.4 ppts in the period from 2021 Q1 to 2024 Q1 relative to what's expected from history. That's a huge shortfall in real wage growth, and an unusual one from a historical perspective.

Some economists attribute this shortfall in real wage growth to the surprise nature of the inflation surge that began in 2021 and continued through mid-2022. Because nominal wages adjust slowly, real wages initially fell in the wake of the inflation surge but will catch up over time, according to this story. No doubt, the surprise nature of the inflation surge played a role in short-run real wage dynamics. As the main explanation for the real wage shortfall since early 2021, however, this story looks increasingly untenable. It has now been nearly two years since the inflation surge began to reverse. Yet, as figure 15.5 shows, we have yet to see any signs of a real wage catch-up effect.

If the alternative story is correct, we can expect unusually strong real wage growth in the near future as wages finally catch up with the surprise inflation. That will raise labor costs relative to productivity, creating inflationary pressures. In contrast, my interpretation carries no implication of unusually strong real wage growth in the

near future. Instead, it says we can expect real wage behavior to resume prepandemic patterns once (a) social distancing no longer depresses labor force participation, and (b) compensation fully adjusts to higher WFH levels. Social distancing is a largely spent force and will remain so, barring another pandemic-like shock. The wage-moderation effects of the shift to WFH have mostly played out by now, in my judgment. Thus, I anticipate that, going forward, real wage growth will return to its usual relationship with productivity growth and labor market tightness.

That said, the shift to WFH set in motion two longer-term forces that may restrain labor costs (relative to productivity) for several years to come. First, it initiated a partial untethering of worker residential locations from employer work site locations (Akan et al. 2024). This process operates mainly on the new-hires margin and will continue for many years as company-level workforces gradually turn over. For employers in high-cost locations, including most dense urban areas, this untethering process facilitates the sourcing of labor from places with lower living costs and lower wages. Second, the shift to WFH opens up new employment possibilities for persons with physical impairments, those with cognitive and psychological conditions that deter face-to-face encounters, persons who live in remote and job-scarce areas, dual-career couples facing joint-location constraints, and those with caregiving responsibilities at or near home. It remains to be seen whether, and how much, these opportunities for new and better employment options will be realized. There is potential for an expansion in labor supply that moderates wage-growth pressures over several years or more.

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Notes

This essay draws on my research with Jose Maria Barrero, Nick Bloom, Brent Mayer, and Emil Mihaylov. Hyoseul Kim assisted in the preparation of figures and tables. Errors are my own.

1. These statistics reflect the CPIAUCSL_PC1 series on Federal Reserve Economic Data (FRED) at https://fred.stlouisfed.org (accessed June 4, 2024).
2. See the Fed's description of the "FOMC's target federal funds rate or change" at https://www.federalreserve.gov/monetarypolicy/openmarket.htm (accessed June 4, 2024).
3. See Federal Reserve Bank of St. Louis (2023). The concept of long and variable lags appears to have originated with Friedman (1948).
4. See, for example, Barrero et al. (2022) and Aksoy et al. (2022).
5. This section is largely drawn from Davis (2024).
6. Initially, the pandemic greatly reduced the share of low-wage jobs and low-wage workers. Later, as the economy rebounded from the pandemic shock and labor force participation recovered, the share of low-wage jobs and low-wage workers returned to more normal levels. I am interested in the behavior of average real wages net of these compositional shifts, which is why I turn to the ECI and the Wage Tracker.
7. Other economists have also taken note of slow real-wage growth in recent years. See Blanchard and Bernanke (2023), for example.
8. That's also true in the industry breakdown of data from the Survey of Business Uncertainty previously discussed. See Barrero et al. (2022). However, the survey data support only coarse industry breakdowns.

16

Unemployment and Inflation Dynamics in the Monetary Policy Armamentarium

Marianna Kudlyak

In the last fifteen years, the unemployment rate and inflation have exhibited behavior that is hard to reconcile with conventional views (figure 16.1). Specifically, during the 2009–19 recovery, unemployment declined from 10.0% to 3.5%, while inflation stuck closely to the Federal Reserve's target of a constant 2%. A constant-natural-unemployment-rate view suggests inflation would rise. In the pandemic cycle, unemployment shot up to 14.7%, while inflation did not move much; then unemployment declined rapidly, while inflation rose to 7% and remains today above the 2% target.

We present the findings from our research on the unemployment recoveries and the natural rate of unemployment that help explain this behavior. Specifically, we talk about three things:

1. We find that during a cyclical recovery, unemployment glides down inexorably at a constant, proportional rate.
2. During the 2009–19 recovery, the natural rate of unemployment declined along a similar path.

This chapter discusses findings published in Robert E. Hall and Marianna Kudlyak, "Unemployment and Inflation Dynamics in the Monetary Policy Armamentarium," Hoover Institution, Economics Working Papers, April 18, 2024. The opinions expressed are those of the authors and do not reflect those of the Federal Reserve Bank of San Francisco, the Federal Reserve System, or any other organization with which the authors are affiliated.

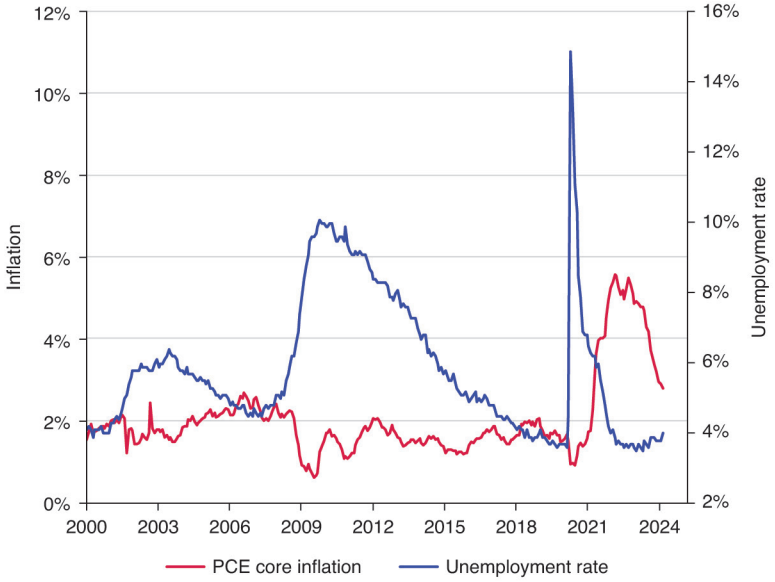

FIGURE 16.1. Unemployment and inflation, 2000–March 2024.
Source: Calculations by Robert E. Hall and Marianna Kudlyak using data from the Current Population Survey.

3. We talk about unemployment and inflation in the pandemic cycle:
   - There are two kinds of unemployment: temporary-layoff unemployment and unemployment due to other reasons. The first kind accounted for the explosion of unemployment in the pandemic but is not associated with declining inflation. The other kind rose only slightly.
   - Regarding the period of excess inflation: the pandemic shock likely loosened inflation anchoring, which resulted in higher inflation during the shock, but also in a faster return of inflation to more moderate levels as the shock dissipated.

Inexorable Recoveries of Unemployment

We start with the summary of findings of the historical behavior of unemployment. Figure 16.2 shows the log of the unemployment rate

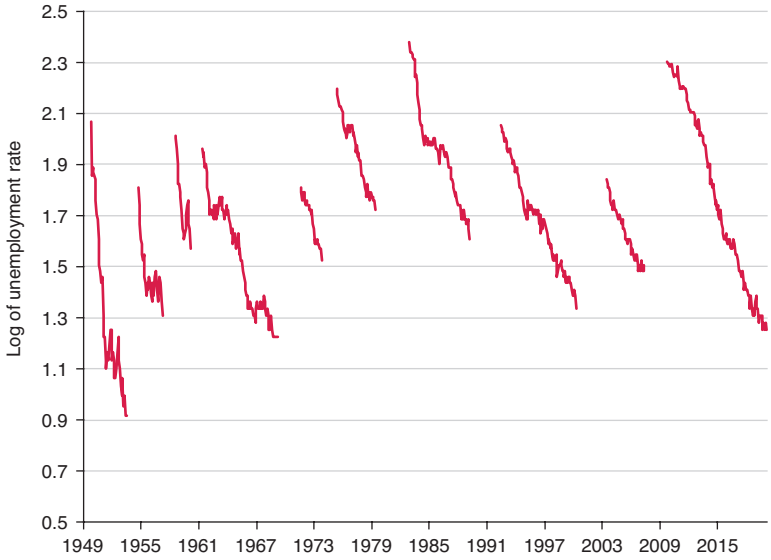

FIGURE 16.2. Paths of unemployment during recoveries, pre-2020.
Source: Hall and Kudlyak (2022b).

during cyclical recoveries. The recession periods are left blank; that is, we plot only the recoveries—from the period when unemployment was highest, during a recession, all the way until it reached a low point right before going up again. In Hall and Kudlyak (2022b), we make two points. First, the speed of a recovery remains approximately constant *during* the recovery. Second, that speed remained approximately similar *across* prepandemic recoveries.

When analyzing the historical behavior of unemployment, we find that it comprises occasional sharp upward movements in economic crises, and, at other times, an inexorable downward glide at a low but reliable proportional rate of about 0.1 log points per year. The rate of decline is approximately similar across the ten recoveries prior to the pandemic. The glide continues until unemployment reaches approximately 3.5% or until another economic crisis interrupts the glide.

In Hall and Kudlyak (2022a), we ask what can be behind these inexorable recoveries of unemployment. Why did unemployment

recover so consistently after every recession from 1948 through 2008? Despite high variations in monetary and fiscal policy, productivity, and labor force growth, there was little variation in the rate of decline of unemployment. Our thesis is that the economy has a powerful tendency to self-recover from adverse shocks. A natural force causes job seekers to match with available jobs and to lower unemployment. The process is slow because a typical crisis breaks worker-firm employment relationships, and creating new, stable relationships is time-consuming (Hall and Kudlyak 2019). Recoveries are endogenous—the economy includes a strong internal force toward recovery that operates apart from policy instruments or productivity growth. The internal force is job creation as in the Diamond-Mortensen-Pissarides model, but operating more slowly via negative feedback from unemployment to job creation; the bulge of unemployment created by crises at the beginning of a recovery endogenously slows the recovery.

The conclusion from this research is that during a recovery, unemployment seems little responsive to disturbances. This tentative conclusion, however, still leaves room for effective policy to prevent or moderate recessions.

The Active Role of the Natural Rate of Unemployment

We now proceed to the natural rate of unemployment. Consider a standard Phillips curve in a widely used regression framework. On the left-hand side, we have inflation minus inflation anchor. On the right-hand side, we have a term capturing inflationary pressure. Inflationary pressure is a product of the Phillips curve slope coefficient and the unemployment gap, i.e., the unemployment rate minus the natural rate of unemployment, u^*. Suppose that we have data on inflation and the unemployment rate, and suppose that we also have some construct for the inflation anchor, for example, a measure of

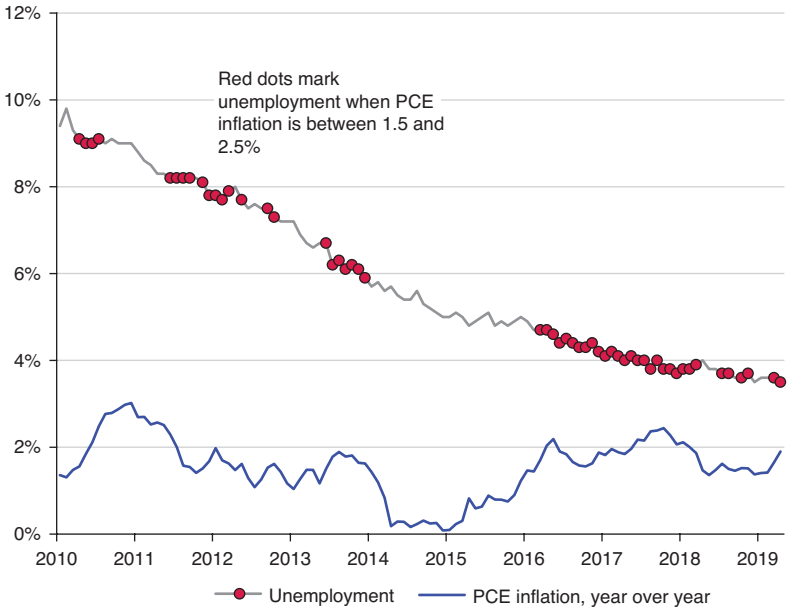

FIGURE 16.3. In the 2009–19 recovery, the natural rate of unemployment stayed close to the actual rate, given an inflation anchor of 2%.
Source: Hall and Kudlyak (2023).

inflation expectations. In this framework, given the data on inflation, inflation anchor, and unemployment, the slope of the Phillips curve and the natural rate of unemployment are not identified. Identification requires bringing in assumptions or additional data.

In Hall and Kudlyak (2023), we propose a new method to identify the natural rate of unemployment based on the Phillips curve's property that when inflation is at its anchored level, unemployment is at its natural rate. This method can only be applied to the periods with stable inflation. The 2007–19 recovery is such a period.

In figure 16.3, the blue line shows inflation, the gray line shows unemployment during the 2009–19 recovery, and the red dots along the gray line denote the months when inflation was within a narrow band of the target of 2%. During those months, the actual unemployment rate reveals the natural rate of unemployment. The figure

shows that during the long recovery from the 2007–9 recession, the natural rate of unemployment closely followed the actual rate of unemployment. This method applies only to the recovery with stable inflation. There is no case of a recession with constant inflation, so we cannot use this approach to learn about the natural rate in recessions.

Existing literature provides other methods to identify the natural rate of unemployment. We can summarize these methods in three broad categories:

1. Conjecture that the natural rate of unemployment is a long-run trend in the actual unemployment rate. The Congressional Budget Office's (CBO) measure of the noncyclical unemployment rate is an application of such an approach.
2. Build a submodel for the natural rate, which expresses the natural rate as a latent variable that follows a specified stochastic process, and estimate the submodel jointly with the Phillips curve. For examples of this approach, see Gordon (1997), Laubach (2001), King and Morley (2007), and Crump et al. (2019 and 2022).
3. Use a general equilibrium model to calculate a counterfactual path of the unemployment rate in a model free of wage stickiness. For examples of this approach, see Galí, Smets, and Wouters (2011) and Furlanetto and Groshenny (2016), among others.

The different methods of identification of the natural rate of unemployment deliver different correlations of the natural rate with the actual rate of unemployment. For example, the CBO's measure implies that variation in the natural rate is a small and unimportant component of actual unemployment. The natural rate of King and Morley (2007) accounts for almost all the movement of the actual rate. The natural rate of Galí, Smets, and Wouters (2011) accounts for around half of the movement of the actual rate.

Why is the correlation between the natural rate of unemployment and the actual rate of unemployment important? The correlation between the natural and the actual rate of unemployment matters

for identification of the slope of the Phillips curve. Since the natural rate of unemployment is unobserved, suppose for a moment that it is left out from the Phillips curve regression. That is, the Phillips curve regression is estimated with the unemployment rate in place of the unemployment gap. It is straightforward to see that the slope coefficient estimated from this regression is the product of two things: the true slope of the Phillips curve (the one estimated with the unemployment gap) and a term $(1 - C)$, where C is the unobserved regression coefficient of the natural rate of unemployment on the actual unemployment rate. If C is zero, that is, if the natural rate of unemployment is uncorrelated with the actual rate, then the slope estimated from this misspecified regression reveals the true slope of the Phillips curve. If, however, there is a positive correlation between the natural rate and the actual rate of unemployment, $C > 0$, then the slope estimate from the misspecified regression will inevitably be close to zero. It is an example of a bias. The Phillips curve estimated from a regression with the unemployment rate instead of the unemployment gap will be inevitably close to flat if the natural rate of unemployment is positively correlated with the actual rate of unemployment (see Hall and Kudlyak 2023).

Consequently, identification of the natural rate of unemployment has implications for a view about the slope of the Phillips curve. The range of opinions about the 2009–19 recovery illustrates the different views. Under one view, which we call the *sticky-and-low* view, the slope of the Phillips curve is small—the curve is flat, while the unemployment gap is large. Under another view, which we call the *flexible* view, the slope is high—the curve is steep, but the gap between the actual unemployment rate and the natural rate of unemployment is small. Both views fit the data that we have discussed. Therefore, more data is needed to distinguish which of these two views holds true.

Under both views, the inflationary pressure during the 2009–19 recovery was low. Evidence from our and other research suggests that the natural rate of unemployment, rather than being a slow-moving

function of mainly demographic forces uncorrelated with actual unemployment, is substantially positively correlated with the actual rate. Under this flexible view, the inflationary pressure during the recovery is low because the unemployment gap is low. Under the contrasting, sticky-and-low view, the inflationary pressure is low because the slope of the Phillips curve is low.

The summary from this research is that low unemployment during recoveries does not necessarily signal high inflationary pressure. This is because the natural rate of unemployment likely closely follows the actual rate.

Unemployment and Inflation in the Pandemic Cycle

Finally, we move on to unemployment and inflation during the pandemic cycle. During the pandemic, unemployment shot up rapidly during a brief period of two months, in March–April 2020. It appears that the rapid increase was not due to a typical deterioration in demand. Instead, the increase coincided with the government-mandated stay-at-home orders (Kudlyak and Wolcott 2020). Unemployment also recovered rapidly, at a much faster speed than during the previous recoveries.

In Hall and Kudlyak (2022c), we show that to understand the labor market during the pandemic and its aftermath, one should examine separately temporary-layoff unemployment and unemployment due to other reasons—*jobless unemployment*. The unemployed on temporary layoff wait to be called back to their jobs and do not go through the search-and-matching process. Historically, a large fraction of unemployment was jobless (Wolcott et al. 2020). For example, in the 2007–9 recession, jobless unemployment reached 9%. In contrast, during the pandemic, the entire run-up in total unemployment from 3.5% to 14.7% in April 2020 was due to temporary-layoff unemployment. The jobless unemployment rate increased slowly and peaked at 4.9% in September–November 2020.

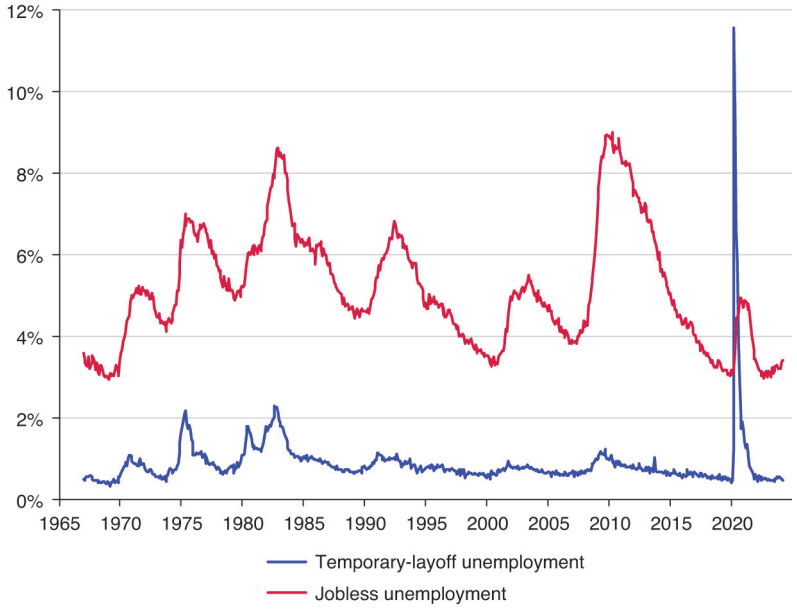

FIGURE 16.4. Rates of unemployment with and without jobs, 1967–March 2024.
Source: Updated from Hall and Kudlyak (2022c).

A key distinction between jobless and temporary-layoff unemployment is that temporary-layoff unemployment returns to normal much faster than jobless unemployment does. A decline in temporary-layoff unemployment takes place as conditions improve and firms recall workers. No search or matching is involved. A decline in jobless unemployment takes time. Creation of new, stable firm-worker relationships is a long and costly process (Hall and Kudlyak 2019). Terminated workers often circle through several short-term jobs before finding a stable job.

When we examine the labor market in the pandemic recession, we find that despite the historically high unemployment rate in 2020, the labor market was comparatively tight. The jobless unemployment rate reached its peak of 4.9%, while in the 2007–9 recession it increased to 9% (figure 16.4). The job-finding rates

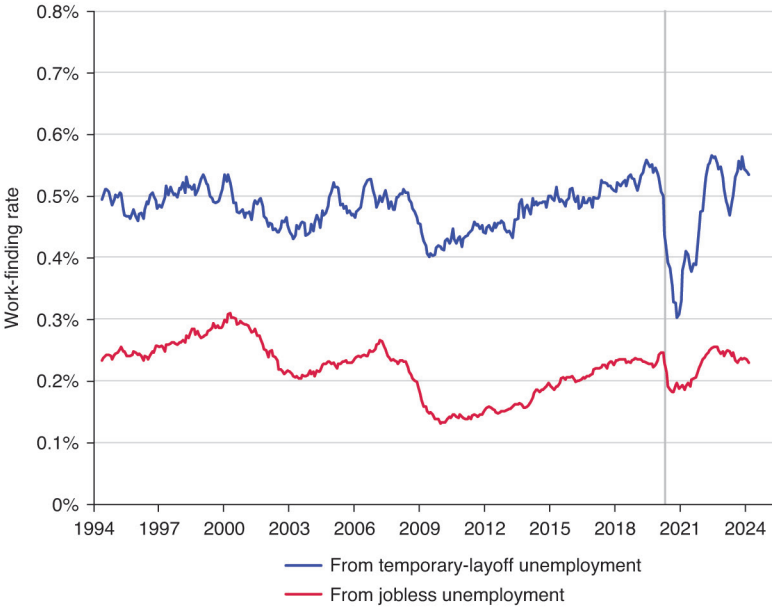

FIGURE 16.5. Work-finding rates, showing the rate at which the unemployed transition into employment from one month to the next.
Source: Updated from Hall and Kudlyak (2022c).

of the jobless unemployed remained relatively high (figure 16.5). The vacancy-jobless unemployment ratio did not drop that much (figure 16.6).

What about inflation postpandemic? Through the lens of our discussion above, the natural rate of unemployment likely closely followed the actual rate during the recovery from the pandemic. However, the pandemic dealt a major turbulence shock to anchored inflation. During the long 2009–19 recovery, inflation became anchored at 2%. The turbulence that the pandemic brought to sellers' economic situations induced more frequent price changes than in the tranquil prepandemic times. The pandemic loosened the anchoring of the inflation rate that prevailed during the 2009–19

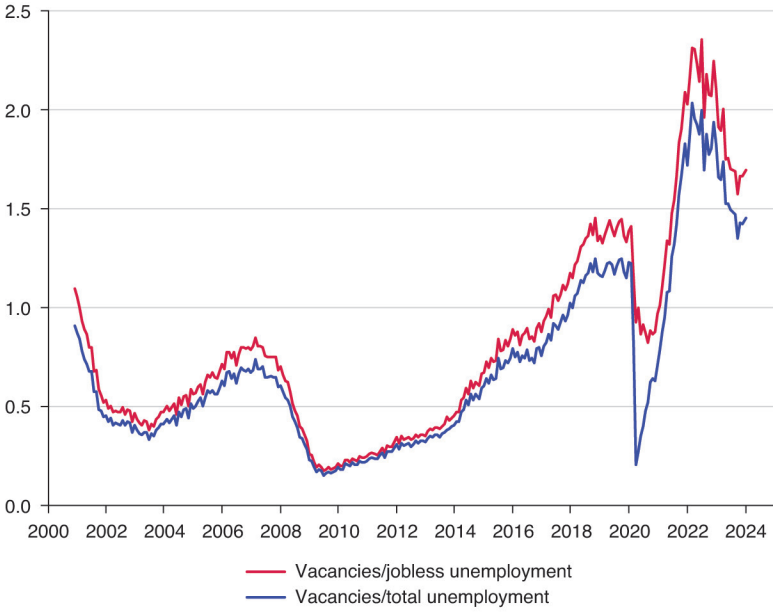

FIGURE 16.6. Vacancy-jobless unemployment ratio, 2000–February 2024.
Source: Vacancy data from Bureau of Labor Statistics, Job Openings and Labor Turnover Survey; unemployment data from the Current Population Survey.

recovery. In the Phillips curve framework, an increase in turbulence makes the curve steeper. That also means that inflation declines faster when the turbulence shock subsides. Our framework does not preclude other factors besides the unemployment gap to affect inflation.

Conclusions

To conclude, we find, first, that in a cyclical recovery, unemployment glides down at a low and predictable rate. Second, in the Great Recovery of 2009–19, the natural rate of unemployment likely glided down a similar path to that of the actual rate of unemployment. Finally, during recoveries, the labor market tightness is

an indicator of labor market pressure, but not necessarily of inflationary pressure. That is, when unemployment is low, the labor market is tight. However, it does not mean that the inflationary pressure is high. Similarly, during recoveries, when unemployment is high, the labor market is slack. However, it does not mean that inflationary pressure is low.

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GENERAL DISCUSSION

VALERIE RAMEY: Okay, we will now take questions from the floor. And, remember, please state your name and affiliation. So, we'll start with John Cochrane. And then, I can't see your name tag, you'll be second. And then Jim Bullard.

JOHN COCHRANE: I have a talent for raising my hand fast, because I know lots of people will want to get in on this one. Marianna [Kudlyak], the lesson I get from your plot is that starting about 2010, u equals u^*. We're in real business cycle land. Forward guidance, quantitative easing, negative interest rates, and fiscal stimulus are just a waste of time. More aggregate demand would not speed anything up. We just have to sit and wait. Supply equals demand. Call us on the next recession.

ROBERT HALL: That's exactly right. Bingo. I don't have to say any more.

KRISHNA GUHA: Thank you. Krishna Guha with Evercore Partners. A question also for Marianna, but anyone else on the panel who'd like to address it as well. There's an interesting story whereby the very elevated level of churn in the US labor market around the pandemic, which we see in the JOLTS [Job Openings and Labor Turnover Survey] flow data for quits and hires, is associated with breaking stale matches and allowing new, better quality matches to form under a strong labor market as the recovery got underway. And a contrast is sometimes drawn between that and the European situation, where furlough-type programs locked in place old and stale matches. It could have different implications for productivity going forward. I was interested whether, for instance, Marianna, your distinction between temporary layoffs and jobless would lead you to reject that as an important story as to what might be going on. Or alternatively,

whether you'd still see a place for that within the sort of larger framing that you provided. Thank you.

JAMES BULLARD: Thank you. Jim Bullard, Daniels School of Business, Purdue. I have two questions for Steve Davis. So one question is, you know, you tell a story about remote-work technology. The technology was around prepandemic, but why weren't the firms, if it was so beneficial, why weren't firms using it more prepandemic? Why was it that this was all revealed by the pandemic shock? So do you have a model of how they had to learn about the technology or something like that in mind, and there would be some transition in there?

And then a related question would be, you know, these workers that are living more than fifty miles from their employer, that sounds like a contract worker to me, or an outsourced worker. So why isn't the firm just saying, okay, I'll just hire you to do some stuff for me, but you'll be a contract worker since you're not going to be at the firm. And you'll do the work that way. And then how would that change some of the data that you are showing about the nature of work? Not only could it be outsourced fifty miles away, but five thousand miles away. So that's another consideration.

RAMEY: Okay, I will let the authors answer the first three questioners. After those answers, the next questioner will be Pat Kehoe.

MARIANNA KUDLYAK: Okay, so on the first question about whether during the recovery the economy resembles a more real-business-cycle economy. When the slope of the Phillips curve is large, we can rewrite the Phillips curve in a supply form where we have u equals u^* plus a term 1 over phi multiplied by (pi minus pi*). The larger phi is, the smaller the effect of the (pi minus pi*) term is on the actual unemployment rate. The larger phi is, the closer the economy is to the real-business-cycle economy.

During the pandemic, there were lots of temporary layoffs in the US. The firms might recall these workers or might choose to

hire new ones. Such an arrangement seems to be more flexible than the government-sponsored furlough programs in Europe. I would conjecture that we can see the difference in the productivities in these economies.

STEVEN DAVIS: Thanks for the questions. On why weren't we doing more work from home before the pandemic, the main explanation turns on the costs and the consequences of experimentation. There was a rational reluctance to experiment, well captured by a quotation from Morgan Stanley's CEO, James Gorman, in 2020, speaking about his own organization. Paraphrasing, he said: "We never would've tried to work remotely of our own accord, of our own free will, because the risks of getting it wrong were too high." So that's the rational reluctance to experiment.

The other thing that was interesting about the pandemic is that certain kinds of experimentation were impossible to do before the pandemic. Think about a professional services firm. It could not see what happens when all of its employees work remotely at the same time as all of its customers and suppliers work remotely. But that's the experiment that we ran, okay? That's not an experiment that would've been feasible for any single firm to run in advance. So my interpretation is that there was a mass compulsory experimentation. The experimentation revealed a great deal of new information. I have direct evidence on that of the following sort. We first did this in the United States. We asked workers: "Well, how did remote work work out for you?" We allowed a range of responses, of course. Most workers were positively surprised by their work-from-home experience. In addition, those workers who claimed to be more successful than anticipated, in terms of productivity when working remotely, were the same ones whose employers planned for them to do more work from home after the pandemic. So survey-based measures of who was favorably surprised by their work-from-home experience line up very well with employer plans for what they would do after the pandemic.

We were so struck by this result that a year or so later we ran a global survey across twenty-seven countries with the same kinds of questions. We found this kind of relationship in every single country; that is, many individuals were favorably surprised by how effectively they could work from home. And it's those same employees in each country who had employers who said, "You know what? You're going to work from home some of the time going forward." So, I think the costs and consequences of experimentation explain why the shift to work from home did not happen sooner and why it stuck, to a considerable extent, after the pandemic struck.

It's also important to understand that the same pandemic event, had it happened twenty years earlier, would probably not have resulted in the same response in working arrangements, because the preconditions were not in place: the internet, broadband internet access in the residential sector, the cloud, remote collaboration tools, videoconferencing technology of acceptable quality—all of those things that came online, more or less, in the previous twenty years that made it practical and productive to carry out many work tasks from home. You can write down a model that tells you that, but I think the evidence is more compelling.

Let me turn to the question about the people living more than fifty miles from their employer. In the Survey of Business Uncertainty fielded by the Atlanta Fed, the executives who tell us that they are relying more on remote work in their organizations as a way to moderate wage costs also tend to be the same ones who are turning more to contract workers. It's not a huge effect, but it's in that direction. So there is something to what you say. But I think it's also important to understand that the biggest shift in working arrangements isn't from traditional working arrangements to people working remotely five days a week or so. The biggest shift is people who used to work on-site five days a week

who are now working at home two or three days a week. And for those people, apparently, their employers and the employees themselves still feel that some face-to-face contact each week is quite important. So I don't think there's as much scope for outsourcing abroad for those jobs and workers as there is for the people who work in an almost entirely remote capacity. For those workers and jobs, I share your view that the arrangement seems ripe for outsourcing abroad, or even just outsourcing somewhere in the United States.

RAMEY: Pat Kehoe.

PATRICK KEHOE: This is for Steve Davis. I agree that when someone is able to work from home for several days per week, their utility is likely to be higher. But is there much direct evidence of how productivity at home and productivity in the workplace compare? At a personal level, I have some assistants who work from home on Thursday and Friday. If you try to call them during that time, there is no response until the next week, but when they are in the office there is an immediate response. Likewise, I thought my productivity would go to zero when I worked from home during COVID. Actually, my productivity only went in half, so I was favorably surprised, just as some people seem to be in your survey evidence. But my productivity at home was still lower than in the office. Would it be possible to find some direct evidence of relative productivity when working from home relative to working in the office?

DAVIS: Yes, it is possible. So look, first, you hinted at something that's important at the end. If you write down a little model of how surprises about productivity in the work-from-home mode affect outcomes after the pandemic's over, if you start from a low enough base, you're right, even a positive surprise, you're still going to go back to the prepandemic arrangements. So that point's right. Look, we have a range of evidence now. It's complex, but I will give you my overall interpretation.

But first, let me tell you what the inference challenge is. What you would think of as hard evidence of the sort that the economists like from their quasi-natural experiments, those studies were done in 2020. But they don't really answer the right question. The question these studies of outcomes during the pandemic answer is: What happens if, with no advance warning, in an organization that's unprepared and has workers who are unprepared, everybody suddenly has to work from home without knowing what the hell they're doing, without knowing how to use the technology, without making the complementary investments? A lot of those studies fit this description, more and less, and find, you know what? There's a big productivity loss.

But that's not the relevant question going forward. The relevant question is, when you select on who works from home in what activities, when the organization has the time to figure out how to make it work and so on, when you select on and optimize over working arrangements, then you tend to see more favorable productivity outcomes. Now, that unfolds over time, so it doesn't lend itself so readily to a natural experiment. But I think perhaps the best overarching evidence that it seems to work okay in many jobs and activities is the picture I showed you, which reveals that work-from-home rates are now about four times the prepandemic level. While the US is a bit of an outlier on the extent of the increase in the work-from-home rate, this phenomenon is global when you focus on people who are college educated. So I think, to me, that's the most compelling evidence, that there were a number of people who were positively surprised, and that those surprises altered their work modes going forward.

The other thing that's worth remembering in this context is that before the pandemic almost everybody was at a corner, the corner being traditional working arrangements where you're on-site all the time. And even if only 20% of the folks who are

forced to experiment learn that, well, you know what, we don't have to be at a corner. We can be at an interior solution, where we're working two days a week at home. And as long as I allocate my tasks effectively over the week, we can get just as much productivity as we had before, but we save on the commute, we get the other benefits of work from home. That's my interpretation of what's happened.

RAMEY: Before we go to Bob King, who's the next questioner (and he'll also be the last questioner), I will use my chair's prerogative to interject a comment. *The Economist* yesterday had an interesting article based on one of the numbers from Steve's survey. Everybody knows that Americans work 15% more hours per year than Europeans. Ed Prescott wrote about this, arguing that higher taxes in Europe were the source of the difference. But it turns out, Steve's survey shows that Americans are now much more likely to work from home than Europeans, so much so that Americans now spend *fewer* hours in the office than Europeans, even though they work more hours overall. I just think that's a fascinating result of the work-from-home revolution that has emerged from Steve's surveys. So go ahead, Bob King.

ROBERT KING: I've been fascinated by the Hall-Kudlyak research program. Can you elaborate on what the core structural features are that lead unemployment to behave so differently than in the standard DMP [Diamond-Mortensen-Pissarides] model, where the transition dynamics force things back really fast? Put another way, I'm curious about how you're going to spell out the real business cycle dimensions. It's clear that in your vision of the world, the natural rate of unemployment's moving around a lot. So it would be great to know why.

HALL: Okay, so the most important thing to say is that there's a fifty-page paper in the Macro Annual in 2021 that's aimed exactly at Bob's question. And it's more successful in disposing of kind-of-standard ideas than it is in erecting a completely plausible new

idea. But what's required in that analysis is something that really slows down the recovery process in the labor market relative to what the DMP model says. So we construct something which involves all the same assumptions of DMP, except for a congestion effect and others. There's a small literature on congestion effects in the DMP model, which we support. But this is still a research program, and we can eliminate things that are just sort of obvious, like it takes a long time for people who've lost work in a major cutback compared to . . . And there is a literature on that. Steve Davis in particular is quotable on that. But we show that it's not nearly big enough to account for the actual slow-but-steady and predictable recovery. But it's very much a fact.

That's what we'd emphasize at this stage, that it's very much a fact and it really does not make sense. The current state of that is that we're very confident that you should not draw a horizontal line to represent the natural rate of unemployment. And we've done a very thorough scrubbing of the literature on that. All this material is available on Marianna's website.

KUDLYAK: So let me also add the following. Our argument is that if the actual (jobless) unemployment rate at the beginning of the recovery is 9%, no policy can make it 5% in a year. The search-and-matching process takes time for these unemployed workers to find jobs. So if during a recovery actual jobless unemployment is 9%, the natural unemployment rate should be somewhere close to that.

RAMEY: All right. Thank you, everybody. Thanks for the great papers. Thanks for the great questions.