

For release on delivery
3:20 p.m. EST (12:20 p.m. PST)
March 1, 2024

Disinflation without a Rise in Unemployment? What Is Different This Time Around

Remarks by

Adriana D. Kugler

Member

Board of Governors of the Federal Reserve System

at the

2024 Stanford Institute for Economic Policy Research Economic Summit
Stanford University

Stanford, California

March 1, 2024

Thank you, Mark, and thank you for the opportunity to be part of the discussions today.¹ For more than 40 years, the Stanford Institute for Economic Policy Research has assisted economic policymakers by producing sharp analysis and fostering the kind of constructive dialogue reflected in today's agenda.

My topic today is the Federal Reserve's dual mandate of maximum employment and stable prices—and, specifically, the tradeoffs that sometimes arise when pursuing these two objectives. I say “sometimes” because there have been times and certain economic conditions in which such tradeoffs did not arise—or at least were not apparent. This distinction is an important one, especially when considering the Federal Open Market Committee (FOMC)'s recent progress in reducing high inflation while the labor market has remained strong. Better understanding the tradeoffs, or lack thereof, in pursuing the dual mandate will help researchers and policymakers draw lessons from these welcome recent developments.

History of the Inflation–Unemployment Tradeoff

In 1977, Congress legislated the Federal Reserve's “dual mandate,” under which the FOMC is required to pursue both maximum employment and stable prices, with both objectives on an equal footing.² At the outset, it is worth stressing that these goals are generally complementary, and I will return to this point shortly. But when they are not complementary, one way to think of the policy problem is in terms of tradeoffs:

¹ The views expressed here are my own and are not necessarily those of my colleagues on the Federal Reserve Board or the Federal Open Market Committee.

² Before 1977, the Federal Reserve viewed itself as having a dual mandate because it was covered by the Employment Act of 1946, which gave the whole federal government a list of objectives that included maximum employment and maximum “purchasing power.” The predominant interpretation of the latter objective was that it corresponded to price stability.

Maximum employment is the highest level of employment that will not cause inflation to escalate significantly above levels consistent with price stability.

Before going into those tradeoffs, I want to emphasize that achieving the Committee’s employment goal on an ongoing basis rests on achieving price stability. Price stability enables long-lasting economic expansions, which strengthen the labor market and expand employment opportunities. This process particularly benefits families and communities that all too often have been left behind.³

But it is appropriate to recognize also that tradeoffs between the goals of maximum employment and price stability can occur in the short term. Indeed, the potential shorter-term tradeoff between unemployment and inflation has long featured prominently among the economic considerations of policymakers. Government action to boost employment through fiscal or monetary stimulus has historically tended to increase aggregate spending and inflation, too. On the contrary, actions to reduce inflation by shifting to contractionary fiscal or monetary policy have tended to slow economic activity and raise unemployment, or at least slow the pace of job creation.

The idea of a short-run tradeoff is reflected in the original specification of the “Phillips curve,” named after New Zealand economist A.W. Phillips, who plotted historical values of the United Kingdom’s unemployment rate and growth in nominal wages between 1861 and 1957, showing an often inverse relationship between the two.

³ López-Salido, Markowitz, and Nelson (2024) provide a longer-term perspective on how the Federal Reserve has viewed price stability as necessary for achieving maximum employment on a sustained basis. See David López-Salido, Emily Markowitz, and Edward Nelson (2024), “Continuity and Change in the Federal Reserve’s Perspective on Price Stability,” manuscript, Board of Governors of the Federal Reserve System, Division of Monetary Affairs, January.

Although the Phillips curve was initially specified in terms of wages, later versions have more typically compared unemployment with price inflation.

Taken at face value, a tradeoff between keeping employment high and reducing inflation would seem to present policymakers with a dilemma. It suggests that when inflation is well above levels associated with price stability, policymakers must engineer a significant increase in unemployment to bring inflation down. Disinflation can be especially challenging when expectations of future inflation are high.⁴ We saw this in the 1970s and 1980s. Convincing households and businesses that the FOMC was committed to reducing inflation required accepting a protracted, though ultimately temporary, period of high unemployment, as then Fed Chair Paul Volcker came to believe. Volcker is widely credited with ending the “Great Inflation” experienced at the time through his willingness to induce a punishing recession. He lowered inflation and kept it down, in substantial part by convincing the public that the Fed would keep inflation in check whatever the cost, thereby lowering expectations of future inflation.⁵

While long experience shows that there can be a tradeoff between policy actions to pursue maximum employment and stable prices, there are times and conditions when this is not the case, or at least when there is little evidence of a tradeoff. For example, for most of the decade after the Great Recession, FOMC policy was, by some measures at

⁴ In the context of achieving disinflation, the tradeoff between inflation and unemployment is sometimes referred to as the “sacrifice ratio.” Estimates of the quantitative magnitude of this ratio vary widely, depending on the period being studied and the nature of the macroeconomic model being used. Model-based explorations do suggest that inflation expectations matter for the size of the ratio. For a helpful discussion and analysis, see Robert J. Tetlow (2022), “How Large Is the Output Cost of Disinflation?” Finance and Economics Discussion Series 2022-079 (Washington: Board of Governors of the Federal Reserve System, November), <https://www.federalreserve.gov/econres/feds/files/2022079pap.pdf>.

⁵ See David E. Lindsey, Athanasios Orphanides, and Robert H. Rasche (2005), “The Reform of October 1979: How It Happened and Why,” Federal Reserve Bank of St. Louis, *Review*, vol. 87 (March/April, Part 2), pp. 187-235, <https://doi.org/10.20955/r.87.187-236>.

least, highly accommodative, yet inflation ran consistently below the Committee's 2 percent target. So when inflation is below target and employment is below maximum sustainable levels, accommodative policy can be used to pursue both sides of the mandate.

Academic economists have debated for decades about the circumstances in which the tradeoff applies. One strand of the research literature proposes that a central bank can indeed achieve good economic outcomes by focusing on a single mandate, an inflation target, and that policies to promote stable prices can also secure low unemployment. In this view, stabilization of inflation ensures that the economy performs at its optimal level, with firms producing just the right amount such that no resources, including workers, are left on the sidelines. This theory fits in a world in which the economy is driven by demand—in such a case, shocks coming from the demand side of the economy can be offset by monetary policy, which works via aggregate demand.⁶

But in the real world—which is not so simple—demand shocks are not the only forces that can drive economic fluctuations. Supply shocks not only exist, but they can also be large and persistent, as we have learned over the past several years. Adverse supply shocks, just like higher inflation expectations, make managing the tradeoff between inflation and unemployment more difficult and costly. While a sharp reduction in demand reduces both economic activity and inflation, a sharp reduction in supply, such as a sudden loss of global oil supply, increases inflation and reduces economic activity.

⁶ For discussion of the notion that inflation-targeting monetary policy can achieve both stable prices and maximum employment, see Ben S. Bernanke, Thomas Laubach, Frederic S. Mishkin, and Adam S. Posen (1999), *Inflation Targeting: Lessons from the International Experience* (Princeton, N.J.: Princeton University Press). More recently, this notion has been called the “divine coincidence” (see Olivier Blanchard and Jordi Galí (2007), “Real Wage Rigidities and the New Keynesian Model,” *Journal of Money, Credit and Banking*, vol. 39 (February), pp. 35–65).

Trying to combat inflation by raising interest rates would further reduce economic activity and employment, while reducing interest rates to boost economic activity and employment raises inflation even higher. Therefore, counteracting a persistent supply shock with monetary policy tools may help with one side of the mandate but create even larger deviations from the other side of the mandate.

Inflation and Unemployment in the Pandemic and Its Aftermath

Let me now turn to the pandemic experience. Inflation picked up in 2021, and by mid-2022, 12-month inflation, based on personal consumption expenditures (PCE), hit 7 percent, well above the FOMC's 2 percent target. It was the most significant surge in inflation since the 1970s, prompting fears that it could raise expectations of future inflation and make getting inflation down again require a steep tradeoff—that is, much higher unemployment.

One more specific concern was that a so-called wage–price spiral would emerge, as may have been the case for a time in the 1970s. In a tight labor market, expectations of continued high inflation can lead workers trying to maintain their living standards to demand higher raises. In a context of strong aggregate demand, firms will likely grant the wage increases to retain their workers—then pass through the resulting cost increase as higher prices. To avoid a continuing spiral, demand and supply in labor and product markets must be rebalanced—through lower aggregate demand, greater aggregate supply, or both.⁷ If achieving this balance requires a drastic reduction in aggregate demand, then sustainably taming inflation could require a high cost in terms of the employment

⁷ For a discussion of wage–price spirals, see Ben S. Bernanke (2006), “The Benefits of Price Stability,” speech delivered at the Center for Economic Policy Studies and on the occasion of the Seventy-Fifth Anniversary of the Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, N.J., February 24, <https://www.federalreserve.gov/newsevents/speech/bernanke20060224a.htm>.

mandate. Fortunately, we appear to have avoided a wage–price spiral this time, as I will discuss later.

As inflation rose and began to appear persistent, the FOMC rightly focused on restoring price stability, knowing that without price stability, the economy would not work for anyone and that high inflation would ultimately undermine the strength of the labor market. While interest rates rose rapidly, some feared that the cost of disinflation would be persistently elevated unemployment. But over the past year or so, that tradeoff has been much less evident than many feared. We have seen inflation cool significantly, falling more rapidly than at any time since the 1980s. Yet unemployment remains near the lowest levels seen only a few times since the 1960s.

How have we managed to avoid the familiar tradeoff during this period and see such welcome outcomes on both the inflation and employment fronts? I would propose a few possible reasons. These center on the fact that the pandemic inflation featured both supply and demand shocks. In the limited time that I have today, I don't propose to get into the debate about exactly how much of the recent inflation can be explained by supply as opposed to demand. But I will discuss how both demand and supply forces have been important in the rise and fall in the inflation rate.⁸

⁸ Precisely quantifying the relative roles of supply and demand in the pandemic inflation will likely remain a controversial pursuit for some time. One approach is to focus on relative movements of particular prices and of specific output categories in a “bottom up” manner, as illustrated, for example, by Adam Hale Shapiro (2022), “Decomposing Supply and Demand Driven Inflation,” working paper, Federal Reserve Bank of San Francisco, February. An alternative approach is to conduct a “top down” time-series analysis relating aggregate data on wages, prices, labor market tightness, and various measures of goods supply conditions, as illustrated by Olivier J. Blanchard and Ben S. Bernanke (2023), “What Caused the U.S. Pandemic-Era Inflation?” NBER Working Paper Series 31417 (Cambridge, Mass.: National Bureau of Economic Research, June), <https://www.nber.org/papers/w31417>. The two approaches can complement each other by providing alternative, but mutually consistent, perspectives on the same problem.

The pandemic caused a significant reduction in supply in some areas of the economy. Limits on the supply of goods resulted from restricted output in many industries. Consider a key U.S. manufacturing industry, auto production. In 2019, the U.S. manufactured 10½ million light vehicles. In 2020, production plunged to 8½ million, with pandemic-related plant shutdowns followed by worldwide shortages of computer chips and other parts.⁹ It has taken the industry a long time to recover—auto production was less than 9 million in 2021 and a bit under 10 million in 2022. Constrained vehicle supply played a big role in boosting auto prices. And it wasn't just motor vehicles; for example, you might recall reports of food processing plant shutdowns, and many other goods-producing industries also suffered from “lost output.” U.S. industrial production dropped at the onset of the pandemic and then remained below its pre-pandemic level until early 2022 despite strong demand for physical goods; indeed, evidence shows that output was held down by insufficient supply of materials.¹⁰

⁹ The auto industry's experience during the pandemic is a good example of how many industries' production functions are, in economists' terms, “Leontief,” meaning that shortages of even one key component can restrict production even if other components are available. The prevalence of this kind of production in many industries made the broader supply chain particularly vulnerable to the extreme pandemic supply shocks. A helpful discussion—which predates the pandemic and focuses on the 2011 Japan earthquake—is Christoph E. Boehm, Aaron Flaaen, and Nitya Pandalai-Nayar (2019), “Input Linkages and the Transmission of Shocks: Firm-Level Evidence from the 2011 Tōhoku Earthquake,” *Review of Economics and Statistics*, vol. 101 (March), pp. 60–75.

¹⁰ Industrial production was low despite strong demand: New orders indexes from many sources were elevated throughout late 2020 and 2021. The Census Bureau's Quarterly Survey of Plant Capacity Utilization features questions on reasons for factory output being below capacity. “Insufficient supply of materials” and “insufficient supply of labor” both surged starting in late 2020 and remained near peak levels from mid-2021 through mid-2022 before starting to move back down. Separately, the Institute for Supply Management's Report on Business Manufacturing PMI (Purchasing Managers Index) features lists of items in short supply each month; the share of major manufacturing-sector input material groups reported as being in short supply surged to about 40 percent during 2021 and has since declined to below 10 percent. For a more formal approach to measuring lost output in manufacturing industries, see Charles Gilbert, Maria D. Tito, and Cynthia Doniger (2021), “Quantifying Bottlenecks in Manufacturing,” FEDS Notes (Washington: Board of Governors of the Federal Reserve System, November 19), <https://www.federalreserve.gov/econres/notes/feds-notes/quantifying-bottlenecks-in-manufacturing-20211119.html>.

But supply problems were not limited to goods; indeed, insufficient supply of labor has also been widely cited by businesses as having held down output. Labor supply was suddenly and severely limited early in the pandemic as workers voluntarily and, in some cases, involuntarily stayed out of the workplace. The labor force did not recover to pre-pandemic levels until mid-2022. Older workers, in particular, left the labor market in large numbers. But even many prime-age workers—those between the ages of 25 and 54—withdrawed because of school disruptions and health concerns, and prime-age labor force participation remained below its pre-pandemic level until early 2023. A slowdown in immigration, likewise, deprived the economy of a customary source of labor supply growth, as did elevated mortality due to COVID-19.¹¹

Fortunately, these supply shortages for both goods and labor have mostly dissipated. For example, auto production in 2023 nearly regained its 2019 level, and industrial production as well as various goods supply indicators have returned closer to their pre-pandemic levels. Congestion in logistics and transportation networks eased, and firms sometimes found alternative supply chain networks.

In the labor market, shortages directly related to the pandemic have eased, helping restore labor force participation, likely in part because of the reopening of schools, progress with the health situation, and help from childcare subsidies and other policies. Increased capabilities for remote work, allowing for a decoupling between firm and worker location, expanded the pool of available workers and jobs. More broadly, strong labor demand has enticed more workers into the labor market to the point that labor force

¹¹ Per data from the Bureau of Labor Statistics Current Population Survey, the labor force level among foreign-born workers had a pre-pandemic peak about a year before the pandemic and did not fully recover to this peak until early 2022.

participation among prime-age workers is now above pre-pandemic levels. And immigration has rebounded as well.

Another, more subtle source of labor market supply recovery has been improvements in the quality of matches between firms and workers. At any time, a crucial factor that affects labor supply is how well the skills of available workers fulfill the needs of employers. With labor in many sectors in short supply and very high numbers of job openings, many workers quit their jobs to move to new ones. Economists generally believe that increased labor turnover improves worker–firm matches—workers find jobs that make better use of their skills, typically with higher pay, and firms find workers that are better suited for their businesses and are more productive at their jobs. Economic expansions, such as the one that has continued since April 2020, present more opportunities for workers to find a good match.¹² And it appears that workers and firms were pretty efficient at finding each other over the past couple of years, likely upgrading the average quality of a job match in the process.¹³ Higher-quality job–worker matches improve the productivity of workers, serving like a boost to labor supply.

If reductions in supply contributed to inflation, then recovery of that supply would help lower inflation, too. Supply improvements in the goods sector have helped ease

¹² Past research has found that job quality is higher in expansions; see Gadi Barlevy (2002), “The Sullyng Effect of Recessions,” *Review of Economic Studies*, vol. 69 (January), pp. 65–96. In the pandemic specifically, job-to-job flows appear to have featured strong wage growth; see David Autor, Arindrajit Dube, and Annie McGrew (2023), “The Unexpected Compression: Competition at Work in the Low Wage Labor Market,” NBER Working Paper Series 31010 (Cambridge, Mass.: National Bureau of Economic Research, November), <https://www.nber.org/papers/w31010>.

¹³ There are various ways to measure “matching efficiency.” One such measure shows an initial decline in matching efficiency early in the pandemic, followed by a recovery to (roughly) pre-pandemic levels. See Simon Mongey and Jeff Horwich (2023), “Are Job Vacancies Still as Plentiful as They Appear? Implications for the ‘Soft Landing,’” Federal Reserve Bank of Minneapolis, December 1, <https://www.minneapolisfed.org/article/2023/are-job-vacancies-still-as-plentiful-as-they-appear-implications-for-the-soft-landing>.

inflation starting in early 2022; for example, in January, the 12-month growth of new motor vehicle prices was less than 1 percent, far slower than its peak pace above 13 percent in the spring of 2022. More broadly, the overall price level for core PCE goods, which excludes food and energy, was fairly flat last year and has actually declined in recent months.

On the labor side, supply recovery has likely contributed to disinflation by helping to ease the pace of wage growth—especially in the labor-intensive services industries.¹⁴ For private services as a whole, 12-month nominal wage growth, as measured by average hourly earnings, was 4.5 percent in January, down from its peak of 5.9 percent in early 2022. And, sure enough, price inflation in services has also slowed: In core PCE services—which accounts for roughly three-fourths of core PCE—12-month inflation was 4.1 percent in January, down from its peak of 5.8 percent early last year.¹⁵

But supply is not the only factor behind the slowing of inflation. Policies affecting aggregate demand have played a role as well. On the fiscal side, measures of the impact of government spending on economic growth turned negative in 2021 after being strongly supportive in 2020.¹⁶ And in terms of monetary policy, the FOMC’s actions in late 2021 indicated a sooner-than-previously-anticipated start to policy rate

¹⁴ In general, the most labor-intensive sectors (measured as labor costs’ share of value added) are mostly services sectors. As of 2022, the labor cost share of value added was 83 percent in education and health services, 75 percent in professional and business services, 64 percent in construction, and 59 percent in leisure and hospitality. See Bureau of Economic Analysis (2023), “Interactive Data,” tables on composition of gross output by industry,” December, <https://apps.bea.gov/iTable/?reqid=150&step=2&isuri=1&categories=gdpind>.

¹⁵ The connection between wages and prices in services industries has been explored in the economics literature and been found to be a likely contributor to the higher “stickiness” or persistence of services prices relative to goods prices. See Ekaterina Peneva (2011), “Some Evidence on Factor Intensity and Price Rigidity,” *Journal of Economic Dynamics and Control*, vol. 35 (October), pp. 1652–58.

¹⁶ See, for example, the Hutchins Center Fiscal Impact Measure, which estimates the effect of government tax and spending policy on gross domestic product growth. The measure is available on the Brookings Institution’s website at <https://www.brookings.edu/articles/hutchins-center-fiscal-impact-measure>.

increases, with the FOMC beginning to raise the target range for the federal funds rate in March 2022. After that, the Committee tightened its stance of policy expeditiously. The result can be seen especially in areas of the economy that are sensitive to financial conditions. The housing sector saw a significant slowdown, with residential investment declining more than 15 percent in 2022 and remaining flat in 2023. Growth of investment in equipment was tepid last year, likely due in part to restrictive financial conditions, even as we have seen growth in manufacturing construction for semiconductors and electric vehicle batteries that will help address remaining supply-side bottlenecks.

Aside from these examples of subdued spending in policy-sensitive sectors, we can also see the imprint of monetary policy in the anchoring of inflation expectations. Even amid high inflation, households, businesses, and financial markets believed that inflation would eventually return to its target pace. These beliefs were guided by the FOMC's actions: By raising policy rates expeditiously and communicating clearly, the Committee demonstrated its resolve to lower inflation to 2 percent and its commitment to the price-stability mandate. Anchored inflation expectations are apparent, for example, in the popular University of Michigan Surveys of Consumers. Expectations of inflation for the period covering the next 5 to 10 years have remained relatively stable over the pandemic and close to levels seen before the pandemic. And shorter-term expectations rose in 2021 but have come back down recently.¹⁷ Anchored inflation expectations likely matter for actual price setting. That is what modern theories of the Phillips curve

¹⁷ Expected inflation in the New York Fed's Survey of Consumer Expectations shows a similar pattern to that seen in the Michigan survey. And expectations appear well anchored in surveys of forecasters and in market-based measures.

suggest. And the relevance of that theoretical expectation has been suggested by surveys reported by Federal Reserve Bank of Richmond staff: The data show a close relationship between firms' expectations for overall inflation and those firms' own price-setting plans.¹⁸ Crucially, by keeping inflation expectations anchored, the FOMC has likely forestalled the development of wage–price spiral dynamics of the kind I mentioned earlier, while also creating conditions in which inflation has been able to peak at a lower rate than would have been the case if the FOMC had not acted with credibility and clear communication. Real wage growth—that is, growth of wages after accounting for inflation—has turned positive, which means workers' income is rising faster than the cost of living.

A Couple of Final Observations about the Pandemic and Its Aftermath

These developments help bring us back to the inflation–unemployment tradeoff that started my discussion. The pandemic experience has shown that the nature of that tradeoff changes with economic conditions, as does the steepness of the Phillips curve. I will close by making two more general observations about the changes that we have seen during the pandemic and its aftermath, with suggestions about open questions for researchers moving forward.

First, supply curves are, as economists say, “convex”: Their slope increases sharply after quantity supplied reaches a certain point, such that prices rise quickly. The steep part of the supply curve can come into play when demand nears the limits of an industry's capacity. That could happen either because of an unusually large increase in

¹⁸ See Felipe F. Schwartzman and Sonya Ravindranath Waddell (2024), “Inflation Expectations and Price Setting among Fifth District Firms,” Economic Brief 24-03 (Richmond, Va.: Federal Reserve Bank of Richmond, January), https://www.richmondfed.org/publications/research/economic_brief/2024/eb_24-03.

demand or because of a temporary reduction in industry capacity—or both. Research has shown this is the case for individual industries, even in the pre-pandemic period.¹⁹

During the pandemic, many industries experienced large demand shocks or supply curtailment that contributed to inflation, as I have already discussed, and those same shocks also may have exacerbated the inflationary effects by pushing many industries up the steep part of their supply curves.²⁰

Early in the pandemic, the convexity or steepness of industry supply curves was quite costly in terms of our inflation mandate. But it has likely helped us more recently as we have apparently moved back down the steep part of the supply curve in many industries, which has allowed for rapid disinflation.²¹ An open question in the longer term is whether this process has helped firms learn more about supply chains and inventory management such that we might even be less likely to encounter the steep part of supply curves in the future.

Second, with regard to the Phillips curve specifically, I note that in a large class of economic models, the steepness of the Phillips curve is partly a function of how frequently firms adjust their prices, and that seems to be borne out by recent experience.²²

¹⁹ See Christoph E. Boehm and Nitya Pandalai-Nayar (2022), “Convex Supply Curves,” *American Economic Review*, vol. 112 (December), pp. 3941–69.

²⁰ For an accessible discussion, see Deepa D. Datta, Laura Feiveson, Ekaterina Peneva, and Gisela Rua (2022), “Bottlenecks, Shortages, and Soaring Prices in the U.S. Economy,” FEDS Notes (Washington: Board of Governors of the Federal Reserve System, June 24), <https://www.federalreserve.gov/econres/notes/feds-notes/bottlenecks-shortages-and-soaring-prices-in-the-us-economy-20220624.html>.

²¹ For a formal treatment of the notion that monetary policy can be particularly effective at lowering inflation without large output losses following supply and capacity issues, see Xiwen Bai, Jesús Fernández-Villaverde, Yiliang Li, and Francesco Zanetti (2024), “The Causal Effects of Global Supply Chain Disruptions on Macroeconomic Outcomes: Evidence and Theory,” working paper, January, available on the University of Pennsylvania website at https://www.sas.upenn.edu/~jesusfv/Supply_Chain_Disruption.pdf.

²² In a broad set of models on inaction and action in the face of uncertainty and “non-convex” adjustment costs, firms may choose not to change prices even when faced with shocks, provided the shocks are small.

Before the pandemic, the typical price tag lasted more than 10 months, and this figure was reasonably stable for many years. But the pandemic seems to have moved firms into a regime of more frequent price adjustment—that is, shorter price duration. By early 2022, the typical price was lasting less than five months. Price adjustment frequency has since slowed back down, with the latest data from the third quarter of last year suggesting prices were lasting nearly seven months.²³ Continued slowing of price adjustment frequency is an indicator that firms’ costs are rising less quickly and the economy is moving back down the Phillips curve.²⁴ Interestingly, though, in the workhorse academic models used for studying the effects of monetary policy on the economy, the frequency of price adjustment is often assumed to be constant. Of course, economists have thought about this in the past; but a greater understanding of the relationship between the price adjustment decisions of individual firms and overall inflation is an important area for further academic research.²⁵

But large shocks move firms out of their “inaction range” such that a series of large shocks can increase adjustment frequency. This can potentially explain reduced price “stickiness” in the pandemic. However, this outcome was not necessarily inevitable, as higher uncertainty can reduce adjustment frequency (due to raising the “real option” value of waiting), and the pandemic environment has been uncertain in many dimensions. For discussions, see Joseph Vavra (2014), “Inflation Dynamics and Time-Varying Volatility: New Evidence and an Ss Interpretation,” *Quarterly Journal of Economics*, vol. 129 (February), pp. 215–58; and Robert E. Hall (2023), “A Major Shock Makes Prices More Flexible and May Result in a Burst of Inflation or Deflation,” NBER Working Paper Series 31025 (Cambridge, Mass.: National Bureau of Economic Research, March), <https://www.nber.org/papers/w31025>.

²³ See updated data from Hugh Montag and Daniel Villar (2023), “Price-Setting during the Covid Era,” FEDS Notes (Washington: Board of Governors of the Federal Reserve System, August 29), <https://www.federalreserve.gov/econres/notes/feds-notes/price-setting-during-the-covid-era-20230829.html>.

²⁴ The previous inflationary episode experienced by the U.S.—during the late 1970s and early 1980s—saw similar dynamics of price adjustment frequency; see Emi Nakamura, Jon Steinsson, Patrick Sun, and Daniel Villar (2018), “The Elusive Costs of Inflation: Price Dispersion during the U.S. Great Inflation,” *Quarterly Journal of Economics*, vol. 133 (November), pp. 1933–80.

²⁵ I am referring here to the standard “New Keynesian” model, in which firms are allowed to adjust prices only if they receive a random signal whose probability distribution is typically constant and independent of the duration of the firm’s current price level (so-called Calvo pricing). Allowing for price adjustment frequency and inflation to move together is one possible way to generate a “nonlinear” Phillips curve; for example, see Andres Blanco, Corina Boar, Callum J. Jones, and Virgiliu Midrigan (2024), “Non-Linear

For the reasons I have been discussing, I am cautiously optimistic that we will see continued progress on disinflation without significant deterioration of the labor market. With respect to the inflation and unemployment tradeoff, we have certainly learned a lot during the pandemic—but there is still much more to learn. In particular, I look forward to further research that can enrich the economics profession’s understanding of the inflation–unemployment tradeoff and the Phillips curve and continue informing policymakers as well.