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and What the Fed Should Do

POLICY BRIEF

22-3 The Case for a Cautiously Optimistic Outlook for US Inflation

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INTRODUCTION

The Federal Reserve and most other analysts failed to anticipate the surge in inflation in 2021. Now, considerable debate surrounds the question of whether the Fed is too sanguine in anticipating that too-high inflation will mostly take care of itself over the next few years, even as the unemployment rate remains low and monetary policy remains accommodative. This Policy Brief concludes that although the Federal Open Market Committee (FOMC) was too optimistic in the projections it issued in December 2021, the broad contour of its baseline inflation outlook for 2022 and beyond remains sensible and is consistent with the bulk of the evidence available today.[1] The statistical analysis in this Policy Brief was conducted before Russia invaded Ukraine. As a result of the war, the inflation situation will probably get worse during the next few months before it gets better, and could do so in dramatic manner if Russian energy exports are banned altogether. Nonetheless, if the key considerations identified in this Policy Brief remain in place, and if monetary policymakers respond to evolving circumstances in a sensible manner, the inflation picture should look considerably better in the next one to three years.

The case for remaining relatively optimistic about the outlook for inflation despite the run of bad news in recent months rests on two main considerations. First, a variety of special factors that boosted inflation in 2021 are unlikely to directly contribute as much to inflation in 2022. In fact, these factors may put downward pressure on inflation, especially during the second half of 2022 and

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1 At the time the FOMC released its December 2021 projections, the consensus among private forecasters surveyed by Bloomberg was essentially the same as the median FOMC participant's expectation for inflation in 2022. Data made available since then prompted private forecasters to revise their expectations upward a bit. For example, as of February 22, 2022, the median forecast for personal consumption expenditures (PCE) inflation in 2022 stood at 3 percent on a Q4-over-Q4 basis, up from 2.6 percent in December.

beyond. Second, inflation has a much stronger tendency now than it did 30 years ago to revert to a longer-term average rate after deviating from that average. This reversion property helps explain the remarkable stability of inflation over the past couple of decades. If inflation continues to exhibit this property, it should move down, especially as the supply situation improves.

Forecasts generated from standard econometric equations that incorporate both of these considerations are consistent with a baseline outlook in which inflation will be much lower one and two years from now than it is today. Of course, the situation is very uncertain—unusually so. The war in Ukraine increases global uncertainty, especially because Russia is a substantial net supplier of oil and natural gas to the rest of the world. If Russian energy shipments are curtailed or even shut off, the implications for both real activity and inflation could be significant. There will certainly be surprises ahead, war-related and otherwise. Moreover, policymakers cannot count on long-run inflation expectations remaining reasonably stable if inflation remains persistently elevated. For these reasons, the main prerequisite for a successful macroeconomic outcome in coming years is that the FOMC remain willing to adjust its policy stance in light of surprises in the economy.

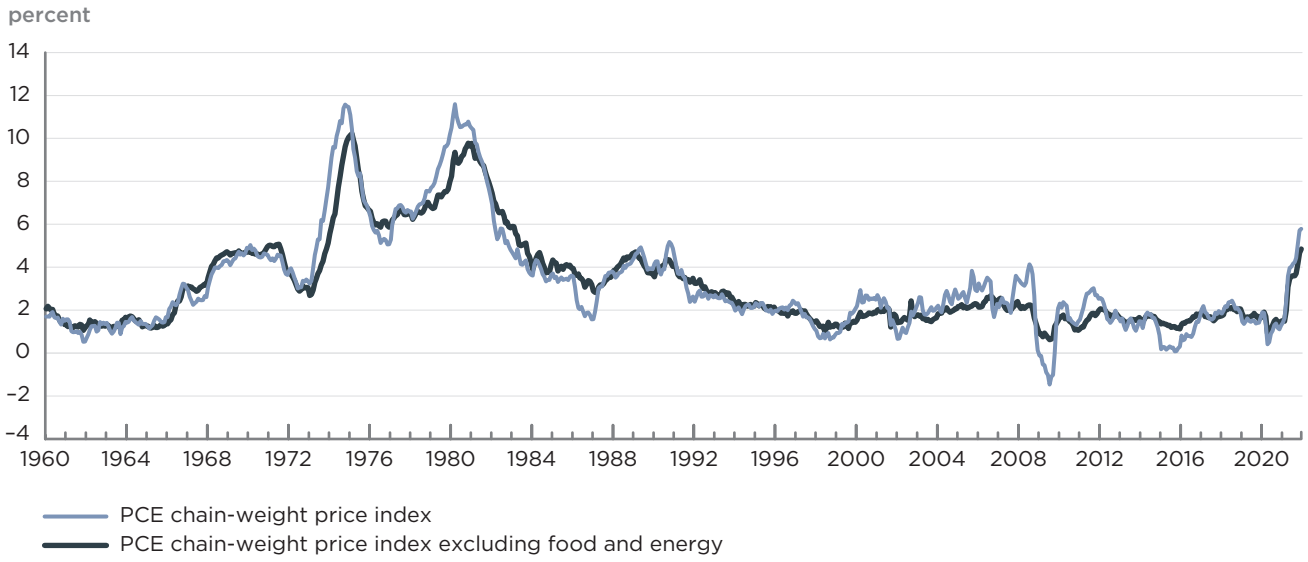
THE FACTORS DRIVING THE 2021 SURGE IN INFLATION

Inflation surged unexpectedly in 2021. According to the personal consumption expenditures (PCE) price index (the measure the Fed puts at the center of its monetary policy), it averaged 5.8 percent over the 12 months ending in December 2021, the highest rate since 1982 (figure 1).[2] Even excluding food and energy prices (two components often responsible for major fluctuations in the headline index), PCE inflation averaged 4.9 percent in 2021. This surge reflected contributions from several major expenditure categories, as shown in the right-most bar in figure 2. Energy and motor vehicles each accounted for about one-quarter of the 4-percentage-point step-up in inflation (measured on a December-to-December basis) from its pre-COVID 2018–19 average level. That higher energy prices greatly boosted headline inflation in 2021 was not unusual from a historical perspective, as oil prices are volatile and were low in 2020 because of the worldwide slump in economic activity. But the large contribution of motor vehicles, which accounts for only 4 percent of consumer spending and is not usually subject to large year-to-year price swings, was unprecedented. Vehicles have been in particularly short supply in recent months, reflecting the shortage of semiconductors that are essential components of modern cars and trucks. Supply-chain problems, coupled with strong demand, were also a factor in the large contribution from other goods. Faster increases in the prices of nonenergy services—a sector that encompasses almost two-thirds of consumer spending—added 0.8 percentage point to the 2021 step-up. More than half of that contribution, however, reflected a rebound from 2020, when prices in this sector were held down by (among other things) the discounting of airline fares and lodging rates.[3]

2 Unless otherwise noted, all figures and estimates reported in this Policy Brief are based on data published through February 22, 2022.

3 In the decompositions reported in figure 2, motor vehicle rental services are included in the motor vehicle category and excluded from nonenergy services. Although a shortage of rental vehicles caused prices in this service category to jump 36 percent in 2021 as vacation travel began to recover, its contribution to overall inflation was less than 0.1 percentage point, because the category accounts for a very small share of total spending.

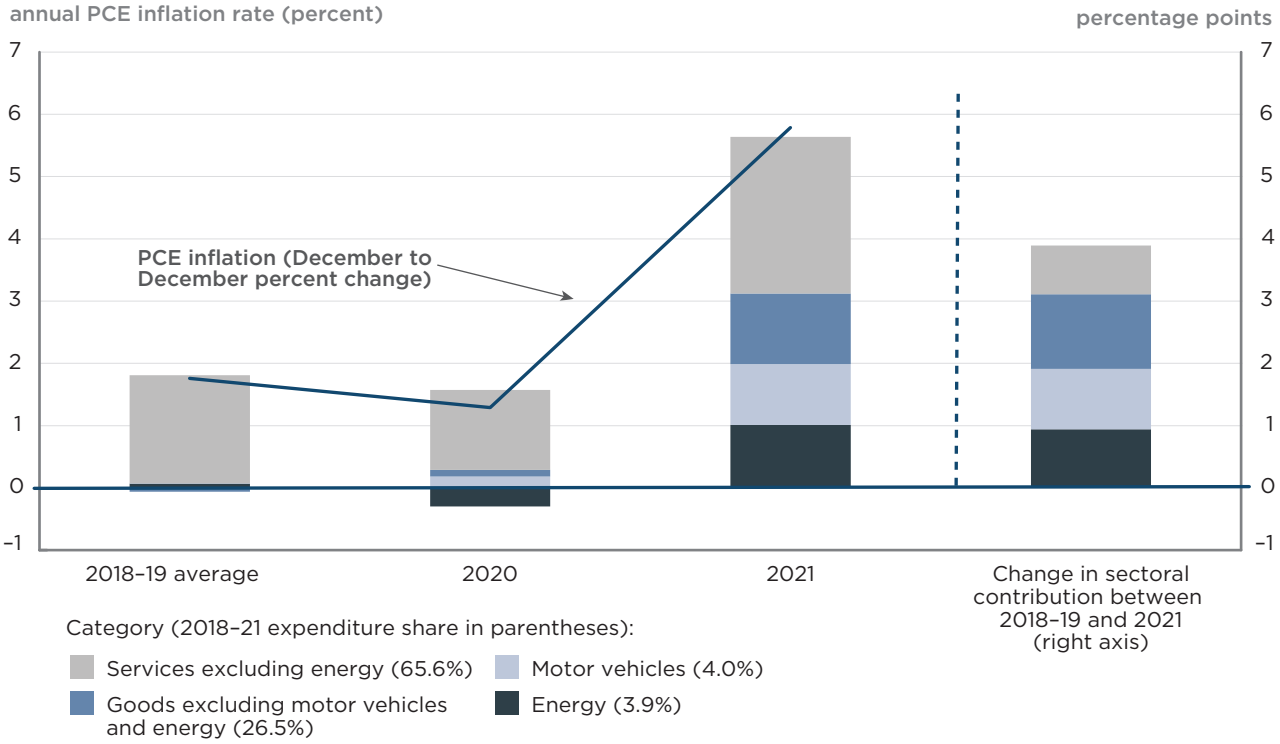
Figure 1
PCE inflation, with and without food and energy, 1960–2021



PCE = personal consumption expenditures

Source: Bureau of Economic Analysis.

Figure 2
Contribution of various expenditure categories to PCE inflation

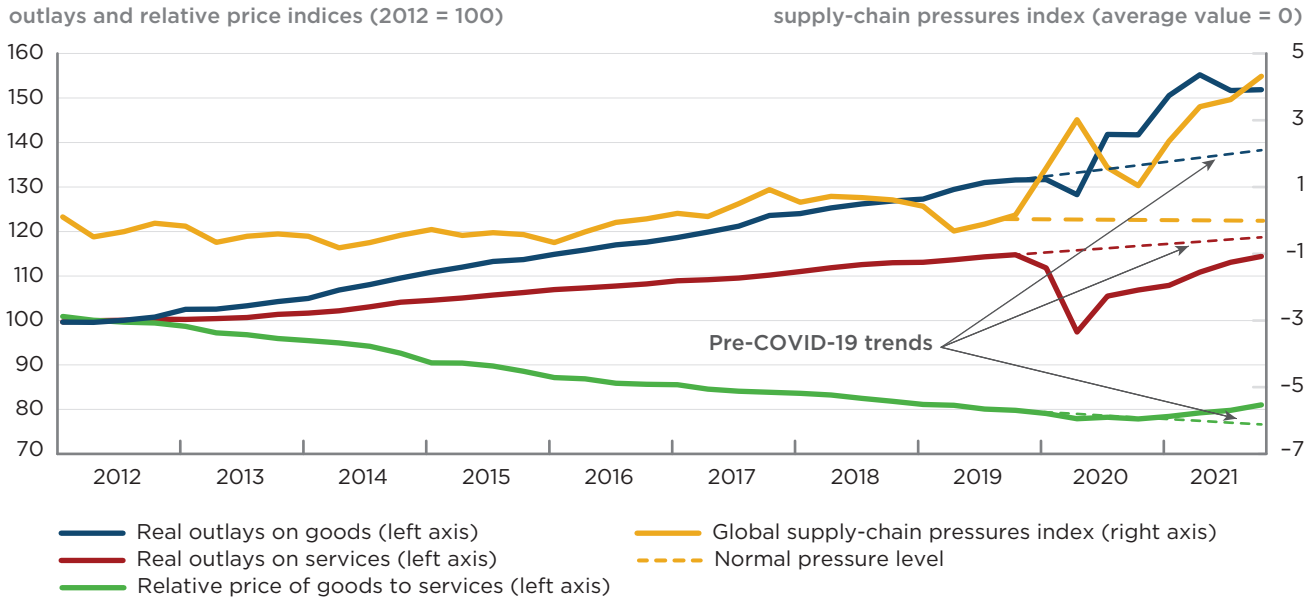


PCE = personal consumption expenditures

Source: Bureau of Labor Statistics and authors' calculations. Decomposition is an approximation based on 12-month moving aveages of annualized log changes weighted by nominal expenditure shares. Motor vehicle rentals are included in the motor vehicle category and excluded from nonenergy services.

Figure 3 provides some additional perspective on how changes in consumer spending patterns and supply-chain disruptions have likely contributed to the increase in inflation. Since the pandemic began, real consumer spending on goods has been remarkably robust (the blue line in figure 3). In contrast, real outlays on services initially fell well below their pre-COVID-19 trend and remain weak (red line). Presumably, these changes in the level and composition of household demand reflect, among other things, a continued reluctance to travel, eat out, and engage in other forms of activity that involve close proximity to other people, combined with fiscal actions that have supported disposable income and overall spending. Even if supply conditions had remained normal, these changing spending patterns would have increased capacity utilization rates in goods-producing industries, putting upward pressure on prices in this sector. But the ability of firms to meet the robust demand for goods has been simultaneously hampered by global supply-chain pressures (yellow line).[4] The net result of these forces is that the relative price of goods departed from its downward secular trend in 2021 and rose appreciably (green line). This increase raised the aggregate price level, because prices for goods are generally much less "sticky" than prices for services.[5]

Figure 3
Real consumer spending, relative prices, and supply-chain pressures, 2012–21



Sources: Bureau of Economic Analysis; Federal Reserve Bank of New York.

4 See libertystreeteconomics.newyorkfed.org/2022/01/a-new-barometer-of-global-supply-chain-pressures/ for information on the construction of this index. For an analysis of the inflation effects of recent disruptions to global supply chains, see libertystreeteconomics.newyorkfed.org/2022/01/the-global-supply-side-of-inflationary-pressures/.

5 The Federal Reserve Bank of Atlanta publishes indexes of "sticky" and "flexible" prices (for data and documentation, see www.atlantafed.org/research/inflationproject/stickyprice). The items in the sticky price index account for 70 percent of consumer spending with services constituting 86 percent of this index. The flexible price index represents the remaining 30 percent of the market basket. Services prices constitute only 11 percent of this index.

SOME REASONS TO EXPECT INFLATION TO MODERATE

In their December 2021 Summary of Economic Projections (SEP), the FOMC predicted that inflation will moderate substantially in 2022 and beyond, a view most private forecasters share. One reason to expect a slowdown is that motor vehicle prices will not continue increasing into the indefinite future at their recent pace; if these prices simply stopped rising, PCE inflation in 2022 would fall by 1 percentage point. If supply-chain pressures ease over time and motor vehicle production expands, as seems likely, prices in this sector should moderate, pulling down inflation for a time.

A similar logic applies to prices of goods other than motor vehicles and energy, particularly if the composition of total spending gradually moves back toward its pre-COVID-19 norm. In fact, outlays on some items might even slump for a time as a result of payback effects, given how much the overall stock of consumer durable goods increased over the past two years.[6] Although the events in Ukraine mean that higher energy prices are likely to boost overall inflation again in 2022, the sector's contribution should drop to zero once oil prices level out.

One sector that probably will put upward pressure on inflation in 2022 is housing. Measures of "asking rents" (the rents asked of new as opposed to incumbent tenants) have skyrocketed: The Yardi Matrix index of average asking rent on multifamily units increased 13.9 percent over the 12 months ending in January 2022.[7] Rents that are asked of new tenants take a long time to diffuse into the rent indexes constructed by the Bureau of Labor Statistics, partly because incumbent tenants are shielded from rent increases for the duration of their leases, which generally run for a year or more. The two main indexes of housing costs in the consumer price index (CPI)—rent of primary residence (often referred to as tenants' rent) and owners' equivalent rent—have already rebounded from their COVID-19-induced sag in 2020 and early 2021. They are likely to accelerate further over the first half of 2022, perhaps contributing an additional ½ to ¾ percentage point to the increase in the CPI.[8] Housing costs are weighted only about half as heavily in the PCE index, so the incremental contribution to that index would be more on the order of ⅓ percentage point.

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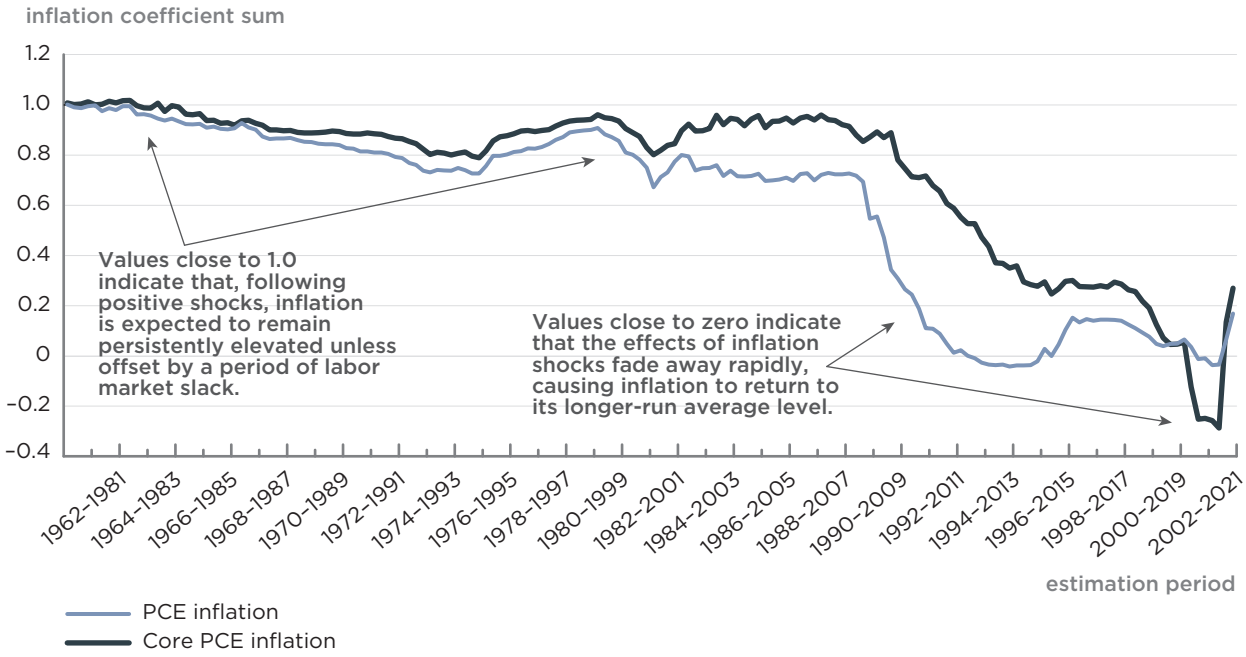
6 Before the pandemic, the ratio of the stock of consumer durable goods (measured at replacement value) to nominal disposable income was stable, at about 0.35. This ratio now stands at about 0.40, an extraordinary increase over such a short period. Motor vehicles account for little of the increase because purchases have been constrained by restricted supply.

7 See www.yardi.com/news/press-releases/multifamily-rent-gains-continue-in-january-2022-yardi-matrix-reports/. The forces driving the recent surge in asking rents are unclear. One possibility is that the pandemic increased demand for rental space.

8 The two main rent indexes published by the Bureau of Labor Statistics (BLS) lag developments in asking rents for two reasons. First, incumbent tenants generally have leases that fix their rent payments for 12 months or more. Second, for methodological reasons, BLS introduces an additional lag of six months. The estimates cited in the text are derived as follows. First, a rent index is constructed that mimics these two sources of lag. The price indexes for owners' equivalent rent and tenants' rent are then separately regressed on this constructed index. The estimated coefficients from these regressions are then used to predict future increases in both BLS indexes, assuming that asking rents increase in the future at an annual rate of 2½ percent. The analysis described here was first reported in "Stealth Threat to Fed Target–Modeling Rent Surge" by David Wilcox, for Bloomberg Economics, December 7, 2021.

Another reason to expect a marked slowdown in inflation concerns the dynamics of inflation over the past 30 years. From the 1960s through the 1980s, shocks to inflation had highly persistent effects. As a result, when adverse shocks drove inflation up, the best prediction was that inflation would remain high even after the adverse shocks ceased. However, since 1990 or so, inflation has become much less persistent, with the sum of the coefficients on lagged inflation in rolling regressions falling well below 1.0—and in recent sample periods fluctuating around zero (figure 4). These simple regression results suggest that when adverse shocks stop driving inflation up, the best prediction now is for inflation to return to some "anchor" point, which is estimated to be about 2 percent in the sample periods that begin after 1990.

Figure 4
Rolling estimates of the persistence of inflation shocks, 1962–2021



PCE = personal consumption expenditures

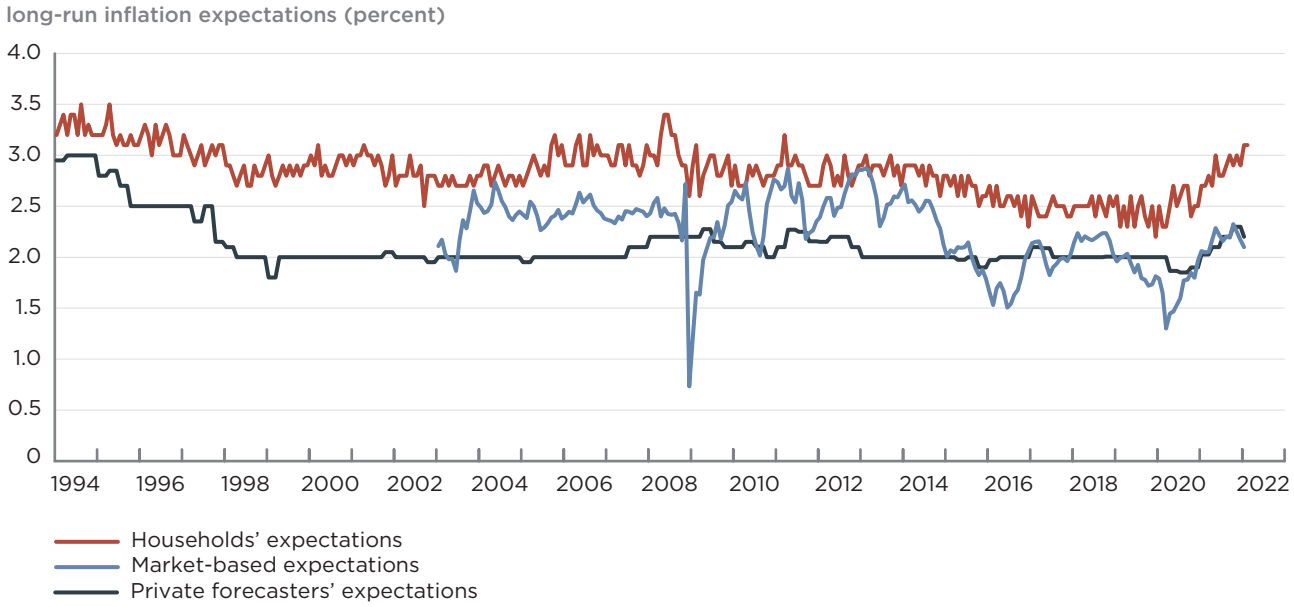
Notes: The figure reports results from rolling regressions of quarterly inflation on four lags of inflation, the unemployment gap, and a constant, where each dot equals the sum of the coefficients on lagged inflation estimated for a specific 80-quarter sample period. The first dot is for the sample period 1960Q2 to 1980Q1, the second dot is for 1960Q3 to 1980Q2, and so forth. The last dot is for the sample period 2002Q1 to 2021Q4.

What determines this anchor point? The standard answer is long-run inflation expectations. Poor monetary policy allowed inflation to move up persistently during the 1960s and 1970s, providing little or no guidance to the public about where inflation was likely headed in the longer run. The result was an environment in which consumers, workers, and firms all came to expect increases in wages and prices every year as a matter of course, to a degree that ratcheted up over time as actual inflation drifted up.

Starting in 1979, however, the Fed adopted policies that reduced inflation to a low level and kept it there. As a result, from the mid-1990s on the public has expected that inflation, even if buffeted in the short run by shocks, would

return in the longer run to its low, normal level. That expectation, in turn, has almost certainly helped stabilize actual inflation. Although several measures of long-run inflation expectations edged up over the past year (figure 5), they are nonetheless only about where they were a decade or so ago, and those levels a decade ago were followed by inflation outcomes that were, on average, slightly *lower* than the FOMC would have preferred.[9]

Figure 5
Private forecasters', market-based, and households' expectations for long-run inflation, 1994–2022



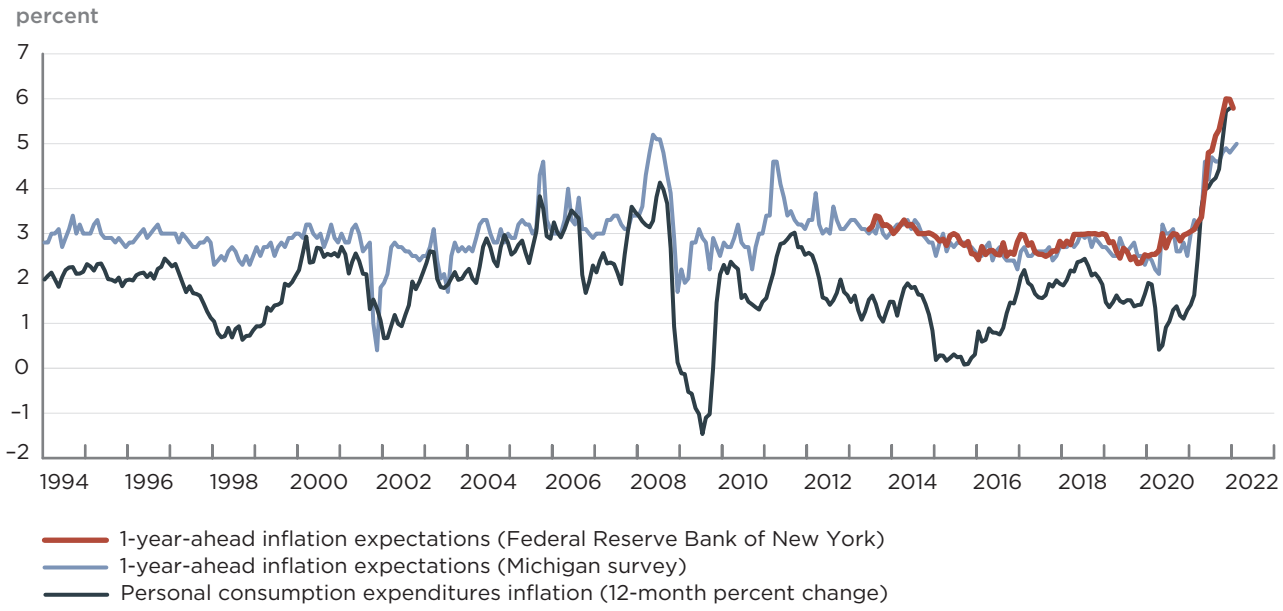
Sources: University of Michigan, Survey of Professional Forecasters (SPF), and FRED Federal Reserve Bank of St. Louis. From 2007 to the present, the private forecasters measure is the median SPF projection for average PCE inflation over the next 10 years; because long-run inflation expectations are only available for the CPI prior to 2007 in the SPF, that measure is used from 1994 to 2006, less 50 basis points to adjust for the average difference between CPI and PCE inflation. The market-based measure is 5-year inflation compensation, 5 years ahead, computed by the Federal Reserve Bank of St. Louis using nominal and indexed Treasury securities. The household measure is the median expectation for inflation 5 to 10 years ahead reported in the Michigan survey.

In contrast to long-run inflation expectations, some shorter-term measures of inflation expectations moved up dramatically over the past year or so. Survey measures of households' expectations for inflation in the coming year by the University of Michigan and Federal Reserve Bank of New York increased 200 to 300 basis points between late 2020 and late 2021 (figure 6). In contrast, over the same period, the FOMC and private forecasters raised their predictions for inflation in 2022 by only 60 to 70 basis points. Taken at face value, this difference might

9 Two points about these measures are worth highlighting. First, the measure based on median responses reported in the Survey of Professional Forecasters is for average inflation over the next 10 years, including the current one. Thus, the small quarter-to-quarter changes seen for this measure largely reflect expected movements in near-term inflation. Second, movements in the measure derived from conventional and inflation-protected Treasury securities reflect both changes in market participants' long-run inflation expectations and important shifts in inflation risk and liquidity premiums.

seem to suggest a risk that inflation could be considerably higher in 2022 than the Fed anticipates. However, households' short-run inflation expectations appear to be overly sensitive to contemporaneous movements in realized inflation, especially the components of inflation that are particularly salient to consumers, such as energy and food prices.[10] Probably as a result, movements in these expectational measures have been *negatively* correlated with actual inflation in the coming year since the mid-1990s. More generally, analyses of the predictive content of the one-year-ahead inflation expectations reported in the Michigan survey suggest that all else equal, increases in this measure signal lower, not higher, inflation ahead.[11]

Figure 6
Measures of short-run household inflation expectations, 1994–2022



Sources: University of Michigan; Federal Reserve Bank of New York.

10 Researchers at the Federal Reserve Bank of New York examined the pass-through of actual inflation on short-, medium-, and longer-term inflation expectations, before and after the onset of the COVID-19 pandemic. They found that short-run expectations remained highly sensitive to inflation realizations in the COVID-19 period, as they were before. They also found that the pass-through from short-term expectations to longer-term expectations declined during the COVID-19 period. They concluded that "these findings indicate that consumers are taking less signal than before the pandemic from inflation news in updating their longer-term expectations" and that "they do not view the current elevated inflation as very long-lasting." See Olivier Armantier, Leo Goldman, Gizem Koşar, Giorgio Topa, Wilbert van der Klaauw, and John C. Williams, "What are Consumers' Inflation Expectations Telling Us Today?" February 14, 2022, libertystreeteconomics.newyorkfed.org/2022/02/what-are-consumers-inflation-expectations-telling-us-today/.

11 For the period 1994–2021, the correlation of 12-month inflation with one-year-ahead expected inflation reported in the Michigan survey one year earlier is –0.28 for the PCE price index and –0.08 for PCE prices excluding food and energy. In contrast, correlations are positive and large for the period 1979–93. Regressions of 12-month PCE inflation on a constant, inflation one year earlier, and the Michigan one-year-ahead inflation measure recorded one year earlier yield a coefficient on the Michigan measure that is negative for both total and core PCE inflation for the 1994–2021 sample period. (The coefficient on the lagged Michigan measure is also negative when the lagged unemployment rate is included as an additional explanatory variable.) These results are similar to those reported by Jeremy Nalewaik, "Inflation Expectations and the Stabilization of Inflation: Alternative Hypotheses," April 2016, www.federalreserve.gov/econres/feds/inflation-expectations-and-the-stabilization-of-inflation-alternative-hypotheses.htm.

Of course, the stationarity of inflation over the past three decades or so is not an intrinsic property of inflation. It predominantly reflects the much-improved conduct of monetary policy that began under Paul Volcker. That tendency will be preserved only if monetary policymakers continue to do what is necessary to control inflation over the medium and longer terms. The stationarity property nonetheless affords policymakers more latitude today than would have been available to them in the 1970s: To a much greater degree than would have been possible back then, they can test the proposition that inflation will largely take care of itself rather than having to move preemptively to create a recession to bring inflation down. That said, if core inflation fails to moderate as expected in coming quarters, they will need to act.

FORECASTS FROM STANDARD SIMPLE MODELS

If long-run inflation expectations remain stable, the prospects for a substantial moderation in actual inflation in 2022 and beyond are favorable. To substantiate this claim, we generate forecasts of core PCE inflation using estimated expectations-augmented Phillips curve equations of the sort used by forecasters at the Fed and elsewhere to inform their projections. As discussed in appendix A, these equations are specified so that inflation depends on three factors: a weighted sum of lagged inflation and the Survey of Professional Forecasters (SPF) measure of expected long-run inflation, a measure of aggregate labor utilization, and changes in the relative price of nonoil imports. We estimate the coefficients on these three factors using quarterly data from 1994 to 2021 and then use the equations to project inflation from 2022Q1 through 2024Q4.

For our first projection, we measure labor utilization using the unemployment gap, defined as the unemployment rate less its natural rate (U^*), the unemployment rate consistent with stable inflation in the long run. We assume that the unemployment rate from 2022 to 2024 follows a trajectory consistent with the median projections of the unemployment rate reported in the December 2021 SEP, which shows it falling to 3.5 percent by late 2022 and remaining flat thereafter. Using a "state-space" model of the supply side of the economy, we estimate that U^* currently equals 4.1 percent, nearly the same as the FOMC's median projection for the longer-run unemployment rate (4.0 percent). In addition, this projection assumes that long-run inflation expectations will hold steady at 2.0 percent, consistent with the latest reading from the SPF.[12]

We also make two important assumptions about future shocks to core inflation. First, we assume that the relative price of nonoil imports will decline at the average pace seen from 1994 to 2019. Second, and more importantly, we assume that the large residuals that (from the perspective of the model) are necessary to explain the behavior of inflation in 2021 will continue to boost inflation in 2022, albeit to a lesser degree that gradually fades to zero.[13] The

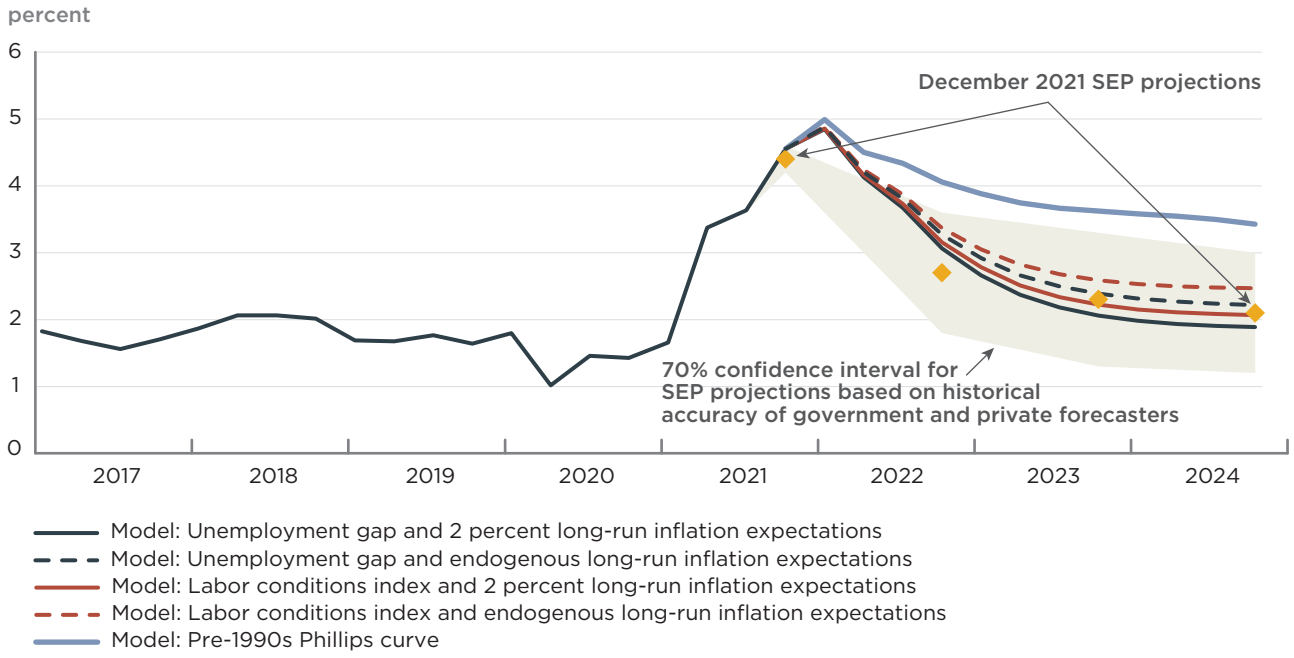
12 In the survey released on February 11, 2022, the median forecasts of average PCE inflation were 2.4 percent for 2022–26 and 2.2 percent for 2022–31.

13 According to the model used to generate our first projection, unexplained shocks directly boosted the annualized rate of quarterly core PCE inflation by 3.1 percentage points in the second quarter of 2021, 1.4 percentage points in the third quarter, and 1.3 percentage points in the fourth quarter. In this projection, we assume that the 2021Q4 shock fades away at 50 percent per quarter starting in 2022Q1. This assumption makes no allowance for any effects on global inflation or real activity from the Russian invasion of Ukraine.

persistence of some positive shocks implicitly allows for the likelihood that shelter costs will increase more rapidly this year than they did in 2021; it also allows supply-chain issues and the unusual composition of demand to continue pushing inflation higher than it otherwise would be. If prices of motor vehicles and other goods were instead to decline modestly, these declines would manifest as *negative* shocks to the model for a time, all else equal.

Under these assumptions, the model predicts that four-quarter core PCE inflation will moderate to 3.1 percent by the end of 2022 and about 1.9 percent by late 2024 (as indicated by the black solid line in figure 7), slightly below the FOMC's projection. Projected inflation runs a little below long-run inflation expectations in 2024, despite relatively tight labor market conditions, because of the downward trend in relative nonoil import prices. If the projection were conditioned on the assumption that shocks to the equation stop immediately rather than fading gradually to zero, the model would predict an even greater moderation in core inflation in 2022, to 2.6 percent, although it would expect it to level out at little under 2 percent in 2024.

Figure 7
Forecasts of core PCE inflation from estimated Phillips curve models, 2017–24



PCE = personal consumption expenditures

Sources: Bureau of Economic Analysis; Federal Reserve Board; and authors' calculations. See the text and appendix A for further information about the estimated Phillips curve models and the conditioning assumptions for the projections. Projections are for the four-quarter percent change in the PCE chain-weight price index excluding food and energy. The confidence interval is the one reported by the Federal Open Market Committee (FOMC) for overall PCE inflation in the December 2021 Summary of Economic Projections (SEP), interpolated quarterly by the authors.

Of course, we cannot be certain that long-run expectations will hold steady at about 2 percent in an environment in which actual inflation has been running at a much higher level. To explore the risk associated with an upward drift in long-run

expectations, we also show in figure 7 a projection in which these expectations are allowed to update based on recent realizations of actual inflation; the other conditioning assumptions are the same as before.[14] Under this assumption, the projected moderation in actual inflation through 2024 is reduced somewhat, although it remains substantial, as shown by the black dashed line.

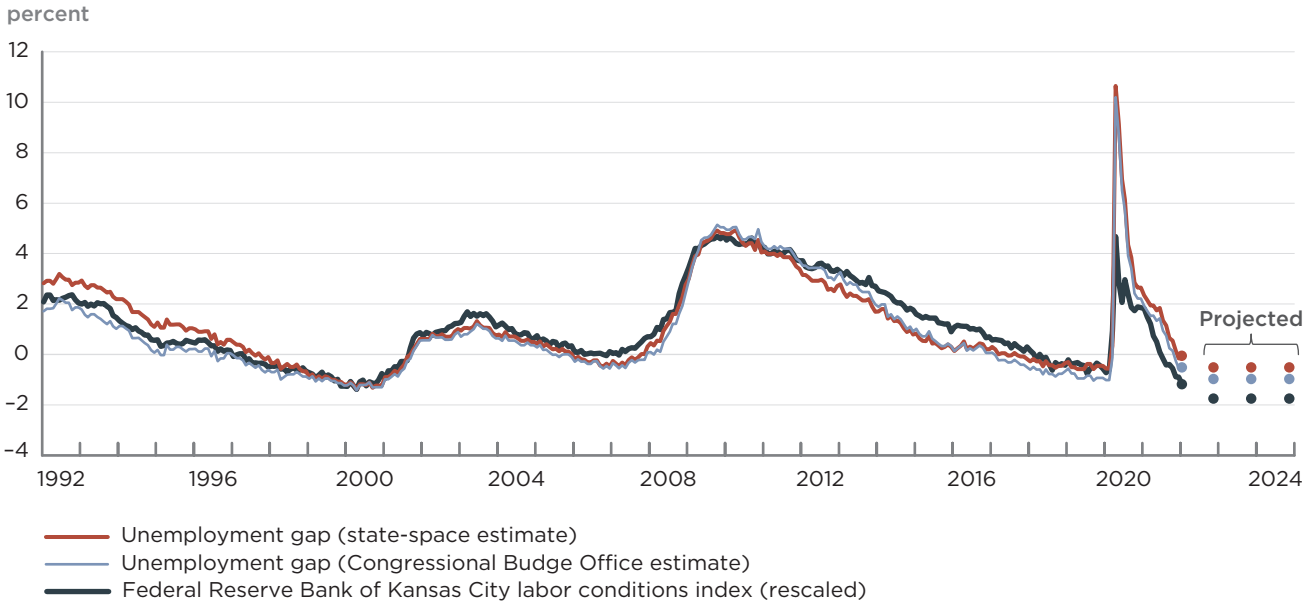
One issue with these results is that the unemployment gap likely understates how tight labor markets currently are. Although the unemployment rate is now close to its estimated long-run level, quits and job opening rates are the highest seen since the Job Opening and Labor Turnover Survey (JOLTS) began 20 years ago. Help-wanted signs are ubiquitous, wage gains have risen, and many firms are offering large signing bonuses and other unusual incentives to attract new workers. At the same time, nonfarm payroll employment and labor force participation remain well below their pre-recession levels, complicating any assessment of overall labor market conditions. The Federal Reserve Bank of Kansas City (FRB-KC) uses a statistical filter to combine the signals from a wide variety of labor market indicators regarding the tightness of the labor market.[15] Before the pandemic, the resulting labor conditions index—shown as the black line in figure 8, rescaled for comparability to the unemployment rate gap—tracked the unemployment gap closely, whether the latter is measured using our state-space estimate of U^* or the estimate published by the Congressional Budget Office. But over the past two years, the index suggests that labor market conditions have been tighter on average than the unemployment rate alone would suggest.[16]

14 In this projection, we assume that long-run inflation expectations in 2022Q1 equal 2.2 percent, the median forecast for average inflation over the next 10 years reported in the SPF released in February 2022. Thereafter, expectations respond to actual inflation at a speed calibrated to match that seen during the disinflation period of 1980–94—a high degree of sensitivity that contrasts with the almost complete insensitivity of the SPF measure seen since the mid-1990s. The calibration implies that a permanent 1 percentage point increase in the core inflation rate would cause long-run inflation expectations to increase by ½ percentage point after 12 quarters and by a full percentage point in the longer run. See appendix A.

15 The index equals the first principal component of 24 labor market indicators (for data and related information, see www.kansascityfed.org/data-and-trends/labor-market-conditions-indicators/). Because overall resource utilization is hard to measure, the FRB-KC index—comprehensive as it is—may understate (or overstate) the current tightness of the labor market. Analysts at Goldman Sachs have proposed a different measure of slack, based on the difference between job openings and employment; rescaled, their measure implies that current conditions are equivalent to an unemployment gap of about –2½ percent. The superiority of their proposed measure over others in explaining inflation is not clear, however, based on the results they present. See Joseph Briggs and Jan Hatzius, "More Jobs than Workers: A New Measure of Labor Market Tightness," Goldman Sachs Economics Research, February 18, 2022.

16 One might also wonder what our simple Phillips curve model would have predicted for core PCE inflation in 2021. If long-run inflation expectations are allowed to respond endogenously and the forecast is conditioned on labor market conditions and relative nonoil import prices as they actually unfolded in 2021, the answer would be 2.1 percent. From the model's perspective, essentially all of last year's surge in inflation was therefore caused by unexplained shocks.

Figure 8
Alternative assessments of actual and projected labor market conditions, 1992–2024



Sources: Bureau of Labor Statistics; Congressional Budget Office (CBO); and the Federal Reserve Bank of Kansas City. The two unemployment gap projections assume that the unemployment rate follows a path from 2022 through 2024 consistent with the median projections reported in the December 2021 Summary of Economic Projections (SEP). The state-space projection assumes that *U** will be flat at 4.1 percent while the CBO projection assumes *U** will be equal to 4.4 percent. The labor market conditions index is projected beyond 2021 based on 1992–2019 estimated relationship between changes in the index and changes in the state-space estimate of the unemployment gap and the output gap, combined with quarterly interpolations of the median SEP projections of real activity.

To gauge the inflation implications of this alternative assessment of aggregate labor utilization, we re-estimate the Phillips curve equation using the FRB-KC index in place of the conventional unemployment gap. We project the index through late 2024 based on the historical relationship between movements in the index and movements in the state-space estimates of the unemployment and output gaps, combined with quarterly interpolations of the December SEP projections for real activity.[17] This extrapolation procedure suggests that labor market conditions are likely to remain unusually tight by historical standards over the medium term. We use the re-estimated inflation equation and the extrapolated index to generate alternative inflation projections (the red lines in figure 7). These projections are conditioned on the same assumptions as before regarding relative import prices and the speed at which unexplained inflation shocks in late 2021 will fade over time.

17 The procedure we used to project the FRB-KC index implicitly rules out any possibility that overall labor market conditions could ease over time as COVID-19-related disruptions fade, thereby realigning the index with the SEP–consistent unemployment gap. If, for example, labor force participation were to continue to rise back toward its pre-pandemic rate, worker shortages, quit rates, and wage pressures would presumably moderate, even if higher labor force participation were also to result in somewhat higher overall employment and spending, which seems likely.

Not surprisingly, the alternative model specification predicts core PCE inflation to run at a somewhat higher level through 2024, particularly if long-run inflation expectations are allowed to update in light of realized inflation experience. But the overall picture is still one of a substantial moderation in inflation in 2022 and beyond. Based on the experience of the past 30 years, inflation is relatively insensitive to the state of real activity; in macro parlance, the Phillips curve is rather flat.[18]

It is not impossible to imagine circumstances in which the best baseline projection would call for inflation to remain a substantial problem for a protracted period, but those circumstances strike us as extreme. If, for example, inflation dynamics were to suddenly revert to the instability of the pre-Volcker period, inflation would be projected to remain well above 3 percent through 2024 (as illustrated by the blue line in figure 7).[19] A sudden reversion of inflation dynamics to their pre-Volcker constellation seems highly unlikely, however, as those dynamics arose in response to many years of lax monetary policy. That said, if evidence suggested that such an adverse development were under way, the FOMC would need to respond vigorously to bring inflation back into line with its objective.

One last aspect of figure 7 deserves mention: the confidence interval for the SEP projection. This interval is based on information compiled by Fed staff and presented in each edition of the FOMC's SEP. It is meant to represent the uncertainty surrounding the median FOMC participant's projection, based on the empirical track record of various forecasters over the past 20 years.[20] While the 70 percent confidence interval shown in figure 7 will strike some readers as wide, all FOMC participants in the December 2021 meeting agreed that it was not wide enough—an assessment that we would agree with. In any event, based on data received since the FOMC meeting, it appears likely that inflation in 2022 will come in at the top of the confidence interval shown in figure 7.

To summarize the central claim of this Policy Brief in plain terms, we think a good case can be made for a relatively benign *baseline* forecast of core inflation, in which the FOMC has relatively little work to do in bringing inflation back down to a more acceptable level once COVID-19-induced shocks have faded. But as seasoned forecasters, we would be the first to say that no one should be complacent about this assessment. Uncertainty is unusually high, and actual inflation performance will differ from what is shown in figure 7. We just don't know *how* it will differ.

18 Phillips curves estimated with CPI inflation or growth in hourly compensation generally show a steeper slope than ones estimated using PCE inflation. Those steeper slopes, however, should not be used to project *PCE* inflation.

19 The econometric specification underlying the pre-1990s model projection employs a fairly lengthy lag on inflation, as documented in appendix A. Even given the unstable dynamics implied by this specification, however, the economy would have to be hit by additional shocks this year (and for a time thereafter) for inflation to remain at 4½ percent.

20 Importantly, the inflation forecast errors used by the Fed staff to construct the confidence interval do not yet include the huge forecasting error made by government and private forecasters in 2021. Factoring in that error will cause the estimated interval to widen appreciably.

THE ROLE OF LABOR COSTS

One limitation of our simple Phillips curve analysis is the lack of any explicit role for wage pressures. Nominal compensation gains for private workers—as measured by the employment cost index—picked up to 4.4 percent in 2021, up from 3.0 percent or less in the years before the pandemic (as illustrated by the blue line in figure 9). The pick-up in hourly compensation growth probably did not materially contribute to the recent surge in inflation, however, for two reasons. First, by most measures and in most industries, real wages fell, helping restrain price increases. Second, historically, lagged wage gains have not been good predictors of inflation.[21]

Figure 9
The employment cost index measure of hourly compensation, 1994–2021

Sources: Bureau of Labor Statistics and Bureau of Economic Analysis. Hourly compensation is for all workers in private industry. Real hourly compensation is hourly compensation deflated by the chain-weight price index for nonfarm business output.

21 Econometric evidence suggests that causality runs from prices to wages, though probably not from wages to prices. Empirical models of hourly compensation generally find that current wage growth depends on lagged wage growth, lagged inflation, trend productivity growth, and labor utilization, with wages being more cyclically sensitive than prices and tending to adjust over time to keep the level of real wages in line with its long-run trend; see Yassir Abdih and Stephan Danniger, *Understanding US Wage Dynamics*, IMF Working Paper WP/18/138, June 2018, www.imf.org/~/media/Files/Publications/WP/2018/wp18138.ashx. In contrast, inflation equations that allow lagged compensation growth to affect inflation usually find only small (at most) wage effects; see, for example, Ekaterina V. Peneva and Jeremy B. Rudd, "The Passthrough of Labor Costs to Price Inflation," *Journal of Money, Credit and Banking* (2017), https://doi.org/10.1111/jmcb.12449. Based on these results, last year's higher inflation—along with widespread worker shortages and what appears to have been solid trend productivity growth—likely helps explain the 2021 step-up in wage gains but does not explain the surge in inflation. (A caveat to this conclusion is that recent movements in labor productivity have been affected by compositional changes in the workforce, making it difficult to discern the underlying trend in both labor productivity and unit labor costs.)

Wage gains may increase somewhat farther in 2022 as workers push to make up for last year's fall in real wages in the context of a tight labor market. Given a reasonable estimate of trend productivity growth, such a step-up could result in a 3 to 4 percent increase in unit labor costs in 2022.[22] Although high, such growth in 2022 would not be out of line with the core PCE inflation projections shown in figure 7, given that a historically high level of corporate profits gives firms considerable capacity to absorb higher labor costs and the econometric evidence that labor-cost pass-through effects to inflation are weak. However, *sustained* increases in unit labor costs at this pace would be inconsistent with inflation falling back to 2 percent over time. After a period of recovery of real wages, a plausible baseline expectation is that nominal gains will moderate as the effects of ongoing inflation shocks wane; labor force participation gradually recovers, easing worker shortages; and monetary policy adjusts over time to bring aggregate resource utilization back to a sustainable level.

We cannot rule out that recent events have laid the groundwork for a wage-price spiral that, left unchecked, would cause inflation to rise higher and higher over time. Two factors suggest that this risk is not great, however. First, there are few signs that households, workers, or firms have suddenly come to anticipate substantial increases in wages and prices far into the future. Cost of living adjustments faded from union contracts many years ago, and longer-run inflation expectations remain stable.[23] Second, and more importantly, any wage-price spiral would take time to develop, providing sufficient time for the FOMC to act to stop it.

RISKS TO THE INFLATION OUTLOOK

Considerable uncertainty surrounds the inflation outlook; it is easy to think of reasons why inflation could run higher than the FOMC or most other analysts expect. Faster growth in shelter costs could fuel PCE inflation by more than we anticipate, global supply-chain pressures might continue to intensify by more than we implicitly allowed for in our projections, and import prices could rise sharply. The Russian invasion of Ukraine could continue to raise global energy prices, with spillover effects on other prices. More generally, a variety of sector-specific developments could occur that would manifest as positive shocks to the simple Phillips curve equations. On the other hand, prices of new and used motor vehicles, and possibly other goods, should decline over time, as supply-chain issues work themselves out, and more workers should return to active participation in the labor market as the pandemic eases, relieving pressure on compensation.

22 According to a survey conducted by the Atlanta Fed in February 2022, firms on average expect their unit labor costs to increase 3.6 percent in the coming year, up from 2 percent before the pandemic (see www.atlantafed.org/research/inflationproject/bie). These results are labeled "business inflation expectations."

23 See James F. Ragan, Jr., and Bernt Bratsberg, "Un-COLA: Why Have Cost-of-Living Clauses Disappeared from Union Contracts and Will They Return?" *Southern Economic Journal* 67, no. 2 (2000): 304–24. Cost of living coverage dropped sharply starting in the mid-1980s and continued dropping until the end of their data in the mid-1990s.

Other risks might originate from the "real" side of the economy. For example, output and employment might expand more rapidly than the FOMC and private forecasters currently expect, putting more upward pressure on prices. Even if they did, however, the implications for inflation would be measured in tenths, not whole percentage points, as we illustrated using the FRB–KC labor conditions index. Given how flat the Phillips curve appears to be, the inflation damage from overheated labor and product markets should be limited.

A common rejoinder to this observation about the Phillips curve being flat is that yes, an overheated economy may generate a smaller pickup in inflation but squeezing that added inflation out of the economy will be no less costly in terms of unemployment than it would have been if the Phillips curve had been steeper. That rejoinder is incorrect if long-run inflation expectations remain reasonably close to their current levels. If long-run expectations remain anchored near levels consistent with the Fed's 2 percent objective, the fundamental claim of this Policy Brief will continue to be met: Excess inflation will mostly resolve on its own. The Fed will have to take policy action to ratify that resolution (by eliminating the overheating in real activity), but it should not have to drive activity below its sustainable level to bring inflation back into line with its target.

There is a risk that the expectations-augmented Phillips curve model is fundamentally wrong and that the stability of long-run inflation expectations does not actually matter. Perhaps we live in a world in which no one worries about inflation while it remains low but in which households and firms suddenly pay attention when it is high and respond in an extrapolative way that makes the effects of inflation shocks much more persistent, in line with the experience in the mid-1960s to about 1990. Alternatively, the slope of the Phillips curve may steepen markedly when labor markets become sufficiently tight.[24]

We acknowledge these possibilities but are skeptical that the world behaves in such an abrupt nonlinear manner, for several reasons. For one, core inflation hardly responded—and then only briefly—to the rise in oil prices from $30/barrel in early 2004 to almost $140/barrel by the summer of 2008, to the Great Recession, to the tight labor market of 2018 and 2019, or to the shutdown of much of the economy in the spring of 2020. In addition, if we are experiencing a return to pre-1990 inflation dynamics, long-run inflation expectations should have jumped even if they do not play an important role in propagating inflation. Finally, the recent bout of higher inflation is only a few quarters old; in contrast, the uptrend that culminated in 1979 built up gradually over the preceding 15 years or so.

24 For example, using a large sample of both advanced and developing economies, Forbes, Gagnon, and Collins (2020) find that the shape of the Phillips curve depends importantly on the levels of inflation and the unemployment rate. Their results suggest that inflation could be especially sensitive to overheating in the labor market over the next couple of years. See Kristin Forbes, Joseph E. Gagnon, and Christopher G. Collins, *Low Inflation Bends the Phillips Curve Around the World*, PIIE Working Paper 20-6, https://www.piie.com/publications/working-papers/low-inflation-bends-phillips-curve-around-world.

IMPLICATIONS FOR MONETARY POLICY

In deciding how best to adjust monetary policy in the current environment, the FOMC needs to carefully consider the unusual nature of the problem it confronts. The 2021 surge in inflation resulted mainly from COVID-19-related sectoral developments rather than the classic situation of aggregate demand outstripping the overall economy's long-run productive potential. The direct inflation effects of these developments are likely to fade over time, although there certainly could be bumps along the way—if, for example, a new and disruptive virus variant were to emerge, or rent increases were to be larger than expected. To date, measures of long-run inflation expectations have remained reasonably stable, and current wage pressures do not appear unsustainable. These factors encourage us to think that when the unusual upward pressures on relative prices in certain sectors stabilize, most of the current inflation surge should recede, though the war in Ukraine will push back the date at which that occurs.

Given this assessment, which is subject to considerable uncertainty, what should the Fed do? Navigating the path ahead will require balancing two main considerations that are, to some degree, in tension with one another.

First, to the maximum extent possible, the FOMC should look through today's elevated inflation readings and any future bumps that may occur and focus instead on attempting to discern where inflation is likely to settle out two to three years from now. As part of that effort, it should avoid unnecessarily restraining real activity in the near term to combat an inflation problem that can be reasonably expected to, for the most part, self-correct over time. If that expectation proves correct, inflation over the medium term can probably be brought under control by gradually raising the federal funds rate to its neutral level, but not necessarily much further if at all.[25] Creating the expectation now that the federal funds rate will go substantially beyond estimates of its neutral level would probably do little to check the forces likely to continue pushing inflation up over the next few quarters, in part because the influence of monetary policy on inflation takes many quarters to emerge.[26]

Second, the Fed must safeguard its credibility and demonstrate that it continues to understand that it has inescapable and unconditional responsibility for controlling inflation over the longer run. Monetary policy is an appropriate tool for bringing aggregate demand into sustainable alignment with aggregate supply over time. The FOMC must continue to demonstrate its willingness to shoulder this responsibility, even if doing so comes at the cost of materially restraining the pace of activity. The lesson that Paul Volcker taught the world—that the cost of letting an inflationary psychology become deeply embedded is high—is as relevant today as it was 40 years ago.

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25 Many commentators write as if the current level of the federal funds rate relative to its neutral level is an adequate measure of the stance of monetary policy. That can hardly be so, as real activity depends primarily not on short-term interest rates but on long-term rates, equity prices, the exchange rate, and other financial conditions linked to policy expectations well into the future. In this regard, the stance of monetary policy has tightened appreciably since early 2022, as illustrated by both a steepening of the expected trajectory of the federal funds rate and changes in the expected path of the FOMC's holdings of longer-term assets.

26 Moreover, monetary policy is a blunt tool; higher interest rates would adversely affect spending in all sectors, not just those that have seen elevated price increases. In fact, tighter policy could exacerbate the demand/supply imbalance in housing rental markets, given that residential investment is the most interest-sensitive sector of the economy.

A key difficulty for the FOMC in balancing these two considerations is that no one knows for certain how far the federal funds rate will have to rise to bring overall employment and output in line with potential. The FOMC judges that the neutral rate is about 2½ percent, and financial market participants appear to have a similar assessment. But wide confidence intervals surround even the most sophisticated model-based estimates of the neutral real interest rate, in part because it moves over time in response to many factors. The neutral nominal rate also depends on trend inflation, so if trend inflation turns out to be higher than anticipated, so, too, will the level of the federal funds rate consistent with the Fed's goals of full employment and price stability. For these reasons, the FOMC will have to continuously update its estimate of the neutral rate as events unfold.

Over the past six months, the FOMC moved expectations a great deal about how quickly the Fed is to normalize its policy stance. That movement has been warranted in light of how tight the labor market now seems to be and how high inflation has moved. As this Policy Brief goes to press, financial markets have priced in an expectation that the federal funds rate will rise to about 1½ percent by late 2022 and around 2 percent by late 2023.[27] These expectations do not seem unreasonable. That said, a somewhat tighter stance of policy strikes us as likely to be appropriate. In any event, the Fed will need to adjust the pace and extent of tightening in response to changing conditions, given that uncertainty abounds: The last big macroeconomic surprise has not been delivered. But based on the evidence available today, we think that the Fed may not need to take the federal funds rate materially above its neutral level in the current cycle of tightening.

27 These estimates are computed by the Federal Reserve Bank of Atlanta using prices of futures, options, and swaps; see www.atlantafed.org/cenfis/market-probability-tracker.

APPENDIX A

The specification of our expectations-augmented Phillips curve model is similar to the one discussed by Janet Yellen in a 2015 lecture on inflation dynamics:[28]

$$\pi_t = \beta_1\pi_{t-1} + \beta_2\pi_{t-2} + (1 - \beta_1 - \beta_2)\pi_t^{LR} + \beta_3 SLACK_t + \beta_4 ZRPM_t + \beta_5,$$

where π_t is the annualized quarterly inflation rate for core PCE goods and services, expressed in logs; π_t^{LR} is the median expectation for average PCE inflation over the next 10 years reported in the quarterly SPF;[29] and $ZRPM_t$ is the annualized quarterly log change in the chain-weight price index for nonoil imports deflated by the lagged core PCE price index, weighted by the four-quarter moving average of the ratio of nominal nonoil imports to nominal GDP.

In the first version of the Phillips curve model, $SLACK_t$ is measured as the difference between the unemployment rate and its natural rate, U^*. We derive a historical series for the latter from a state-space model of the supply side of the economy; the current estimate of U^* from this model is 4.1 percent.[30] The unemployment gap series generated by the state-space model is similar to the one estimated by the Congressional Budget Office (see figure 9). In the second version of the model, $SLACK_t$ is measured by the labor conditions index published by the FRB-KC, rescaled to be directly comparable to the unemployment gap.

The first column of table A.1 reports estimation results for the first version of the Phillips curve model for sample period 1994–2021; the second column does the same for the second version. The coefficients of the two versions are essentially the same. The third column reports results for the reduced-form Phillips curve before 1990. In this case, long-run inflation expectations are proxied by the eight-quarter moving average of core inflation, lagged three quarters. A comparison of the pre-1990 estimates with ones derived from the later sample reveals that the slope of the Phillips curve became much flatter over the past 25 years (–0.077 versus –0.153). In addition, the differences in the estimated coefficients on the inflation terms imply that the effects of shocks now fade away much more quickly.

Some of the projections generated using the two versions of the Phillips curve allow long-run inflation expectations to respond endogenously to movements in actual inflation. In these cases, the updating equation takes the form $\pi_t^{LR} = \pi_{t-1}^{LR} + .058(\pi_t - \pi_{t-1}^{LR})$, where the gain coefficient is calibrated using data from the 1980–94 disinflation period.[31]

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28 See www.federalreserve.gov/newsevents/speech/yellen20150924a.htm.

29 The SPF data are available at www.philadelphiafed.org/surveys-and-data/real-time-data-research/survey-of-professional-forecasters. This quarterly survey provides private forecasters' predictions of average inflation over the next 10 years beginning in 2007Q1 on a PCE basis and beginning in 1991Q4 on a CPI basis. To splice the pre-2007 CPI data with the PCE data, we first subtract 0.5 percentage point from the former to adjust for the average spread between the measures of inflation.

30 The state-space model is a somewhat simplified version of the one used to construct historical estimates of U^*, potential output, and other supply-side factors for the FRB/US database (see www.federalreserve.gov/econres/us-models-package.htm for details). We estimate the parameters of the model using data for 1963–2019 and then use the Kalman filter to generate historical paths for U^*, trend productivity growth, and other state variables over the same period. We do not use the 2020–21 data in the estimation of either parameters or state variables because its extreme and highly unusual nature distorts the filtering results. Instead, we extrapolate U^* beyond 2019 at its last estimated value (4.1 percent).

31 Because the SPF measure of long-run inflation expectations begins only in 1991, data for the 1980–90 period are based on the discontinued Hoey survey of financial market participants, obtained from the FRB/US database.

Table A.1
Least-squares estimation results for the expectations-augmented Phillips curve

Item	1994-2021 estimation sample		1969-89 Phillips curve
	Version using the unemployment gap	*Version using the rescaled labor conditions index*	
β_1	0.286 (3.4)	0.282 (3.3)	0.534 (5.4)
β_2	0.168 (1.9)	0.172 (1.9)	0.286 (2.7)
$1 - \beta_1 - \beta_2$	0.546	0.546	0.180
β_3	-0.077 (-2.1)	-0.077 (-1.9)	-0.153 (-1.5)
β_4	0.850 (6.3)	0.834 (6.2)	0.836 (3.7)
β_5	0.111 (1.3)	0.110 (1.3)	-0.088 (-0.1)
Adjusted R^2	0.386	0.382	0.757
Equation standard error	0.649	0.651	0.995

Note: Figures in parentheses are *t*-statistics.
Source: Authors' calculations.

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