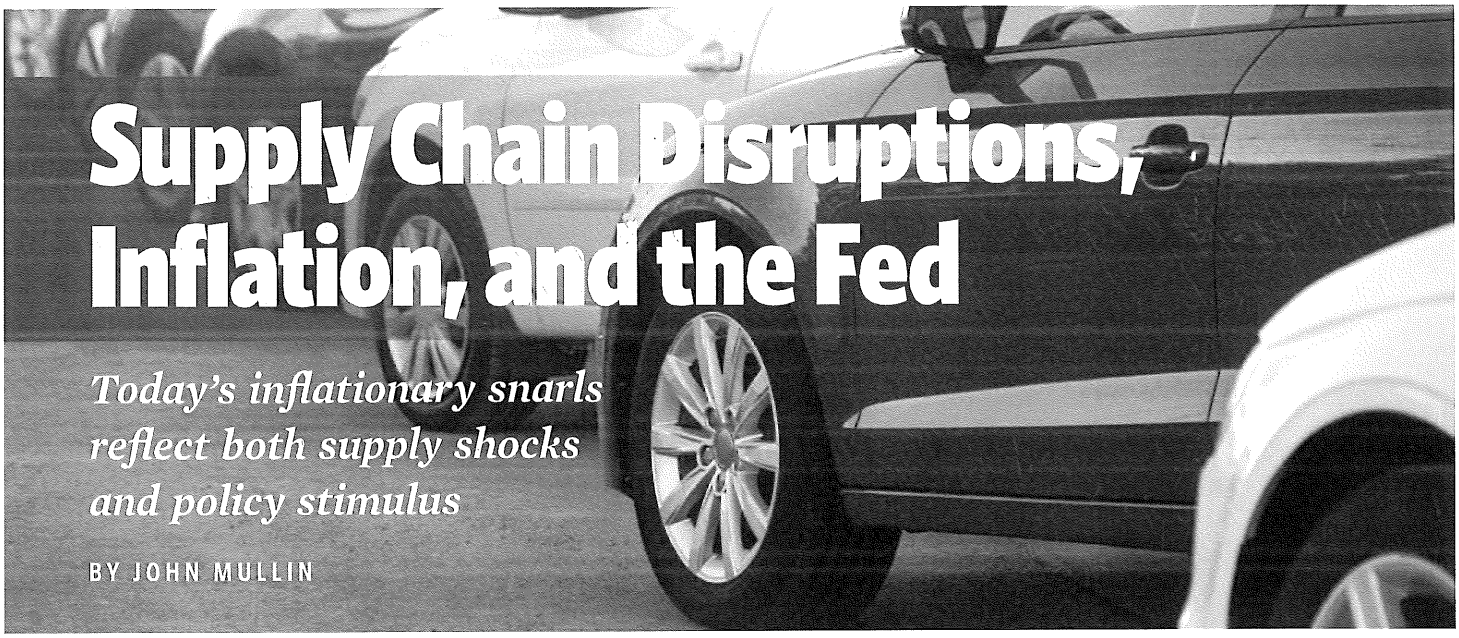


Supply Chain Disruptions, Inflation, and the Fed

Today's inflationary snarls reflect both supply shocks and policy stimulus

BY JOHN MULLIN

Used cars became a hot commodity during the pandemic, with their prices increasing by roughly 50 percent between January 2020 and December 2021. The spike in used car prices was a prominent example of how global supply chain disruptions have contributed to U.S. inflation. It also highlighted the complexity of global supply and demand relationships.

In the early stages of the COVID-19 pandemic, many U.S. and European auto manufacturers shut down production to help stop the disease's spread. Semiconductor producers, concentrated in Asia, responded by shifting production toward chips for electronic devices such as computers and games. As the pandemic progressed, demand increased in these other markets as homebound consumers shifted their spending away from services such as restaurant meals and travel and toward consumer durables.

Later in 2020, when U.S. auto manufacturers resumed production, they faced chip supply shortages. The shortages not only reflected pandemic-related production shutdowns in Asia, they also reflected a reluctance on the part of chip manufacturers to shift production back to chips used in auto production and away from the relatively lucrative market for chips used in electronic devices.

The diminished supply of new cars in the U.S. market provided support for higher used car prices. (See chart.) Since used cars comprise roughly 4 percent of the basket that makes up the consumer price index (CPI), the 50 percent cumulative price increase for the category increased the overall CPI by a cumulative 2 percentage points. According to an analysis by Richmond Fed economist Alex Wolman, the increase in motor vehicle prices ranked as one of the "main culprits" of the U.S. inflationary increase through November 2021.

The used car example illustrates the limited ability of monetary policy to control inflation's short-run trajectory. "It's true that inflation is a monetary phenomenon, in the sense that monetary policy has the ability to control inflation over the medium to long run," says Wolman. "However, even when monetary policy is being successful at controlling inflation, unusual shocks to supply and demand for particular goods and services move inflation around from month to month."

The U.S. economy has indeed faced a string of unusual supply and demand shocks since the pandemic's onset — most of which have tended to boost inflation. But this fact does not necessarily let the Fed off the hook.

A MIX OF SUPPLY AND DEMAND SHOCKS

Since the onset of the pandemic, the U.S. economy has been hit by a series of supply and demand shocks. The first of these, of course, was the pandemic itself. Several early analyses of the pandemic characterized it as a combined supply-demand shock. For example, an NBER working paper in February by Martin Eichenbaum of Northwestern University, Sergio Rebelo of Northwestern University's Kellogg School of Management, and Mathias Trabandt of Goethe University Frankfurt presented a model of epidemics in which COVID-19 "acts like a negative shock to the demand for consumption and the supply of labor."

The view of the pandemic as a combination of negative supply and demand shocks found support in the data. For instance, a 2020 paper by Geert Bekaert of Columbia University, Eric Engstrom of the Fed Board of Governors, and Andrey Ermolov of Fordham University employed statistical methods to "extract aggregate demand and supply shocks for the US economy" during the early stages of the pandemic. The paper estimated that negative aggregate supply and demand shocks both contributed substantially to the initial output decline in 2020.

During the initial stages of the pandemic, there was much concern among economists and policymakers that the pandemic's initial negative effect on aggregate demand could be exacerbated by job destruction and firm closures. This concern was reflected in an *American Economic Review* article by Veronica Guerrieri of the University of Chicago's Booth School of Business, Guido Lorenzoni of Northwestern University, Ludwig Straub of Harvard University, and Iván Werning of Massachusetts Institute of Technology, which presented "a theory of Keynesian supply shocks: supply

shocks that trigger changes in aggregate demand larger than the shocks themselves." Their preferred policy responses included many of the measures implemented by U.S. policymakers, such as emergency loans, enhanced social insurance payments, and accommodative monetary policy.

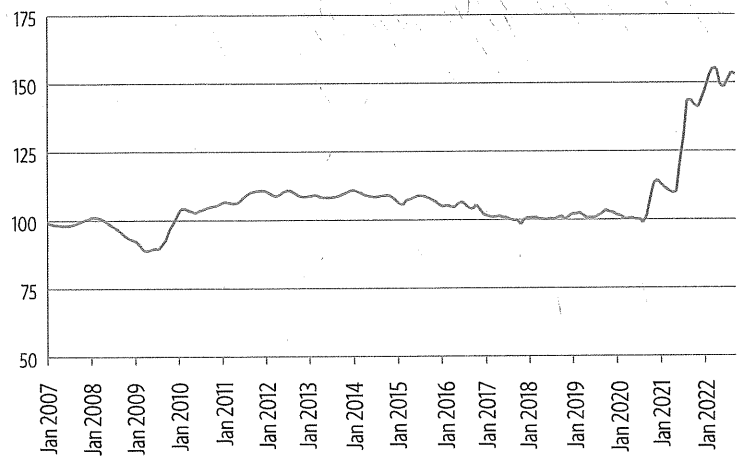
It did not take long for these measures to show results. One of their initial effects was to boost the U.S. personal savings rate. Bank accounts grew rapidly during 2020 as people received stimulus payments from the Internal Revenue Service and enhanced unemployment insurance checks — some received more from these benefits than they had been earning from their former jobs — while drastically reducing their spending on dining, entertainment, and travel. Flush with cash, many consumers quickly started to buy consumer durables.

"There was a huge surge in consumer goods demand, because households were simply unable to spend their cash on going out for a meal or going to the cinema or going on holiday," says Christopher Williamson, chief business economist at IHS Markit, a provider of data and research affiliated with S&P Global. "So, a whole lot of us spent a lot of time ordering new computers, furniture, and bicycles."

In retrospect, there is a broad consensus among economists and policymakers that the combination of increased fiscal spending and an aggressively accommodative monetary policy ultimately overshot the mark by providing excessive economic stimulus. To the extent that they did, the policies arguably constituted a second major shock to the U.S. economy. The Russian invasion of Ukraine in February of this year imposed a third major shock by restricting global oil and grain supplies, causing spikes in the two commodities' prices, which had been already increasing since mid-2020. The combination of the three shocks — the pandemic, the expansionary policy overshoot, and war — left analysts with a hard-to-identify stew in which pandemic-related foreign plant closures, heightened consumer durables demand, and increased global commodity prices have put tremendous strains on global supply networks.

Used Cars Become Hot Commodities

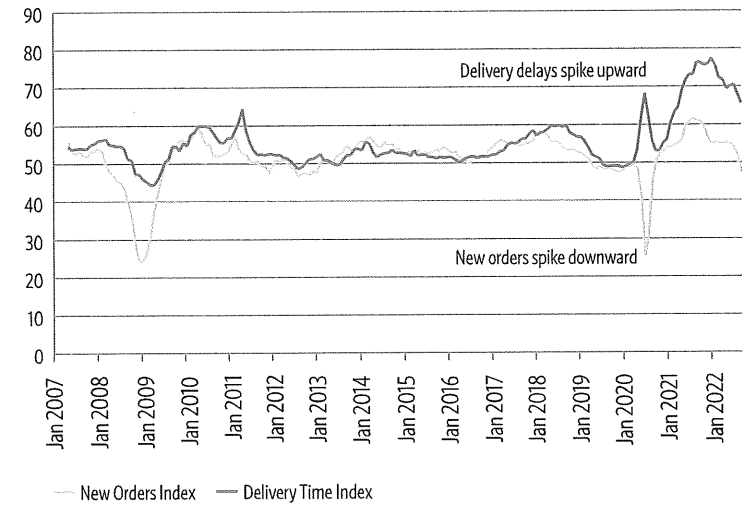
Consumer Price Index for Used Cars and Trucks (Rebased, December 2006 = 100)



SOURCE: Bureau of Labor Statistics via FRED

Unprecedented Delivery Delays

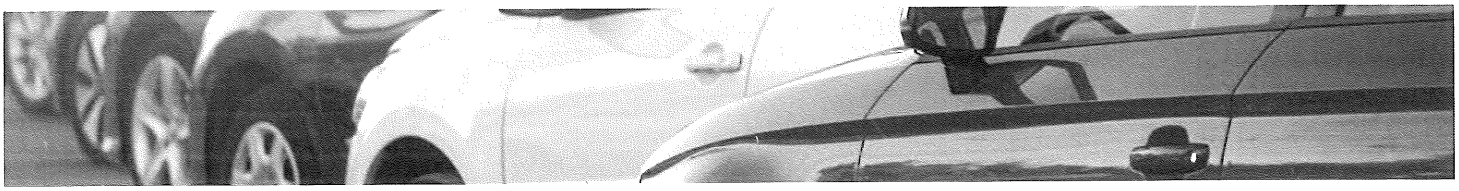
JPMorgan Purchasing Managers Indices: Delivery Time Index and New Orders Index



SOURCE: S&P Global

SUPPLY CHAIN DISRUPTIONS

There is no precedent in recent history for the supply chain disruptions that currently afflict the global economy. The scope of the problem is seen, among other places, in the recent behavior of the JPMorgan Global Purchasing Managers Indices (PMI) delivery time index, which provides a measure of delivery delays around the globe. Ordinarily, the delivery index tends to closely track the JPMorgan PMI new orders index. For example, when the new orders index declined during the 2008-2009 recession, the delivery index declined as well; and when the new orders index subsequently recovered, the delivery index followed suit. This positive correlation is just what one would expect for economic cycles that are driven primarily by fluctuations in aggregate demand: Weak demand means shorter waiting times; strong demand means longer waiting times. (See chart.)



In contrast, the two indexes moved in dramatically divergent directions at the onset of the pandemic. The new orders index plunged, signaling a collapse in aggregate demand, but the delivery time index spiked upward. This negative correlation is just what one would expect for an economic cycle driven by a combination of negative supply and demand shocks.

Supply disruptions (as reflected in the delivery time index) became even more pronounced as aggregate demand (as reflected in the new orders index) recovered. The new orders index peaked in mid-2021, and subsequently declined. Nevertheless, the delivery time index has remained near its historical peak, signaling continued supply problems.

Global companies reported reduced production due to staff shortages that peaked during each of the pandemic's various waves, according to data from S&P Global. Each wave of staff shortages gave rise to a follow-on wave of materials shortages.

Transportation snarls exacerbated the problems caused by plant closures, further disrupting global supply chains. "There were a lot of port closures — notably in China," says Williamson. "With restrictions heavily in place, the ports just couldn't function as efficiently as they could before. And it's not just ships going into ports, but trucks bringing containers in and out of the ports. A lot of containers ended up in the wrong places. It produced unprecedented congestion."

By late 2021, shipping a container through U.S. ports took more than three times longer than it normally did. The congestion at Chinese ports only worsened recently due to COVID-19 lockdowns in Shanghai and other ports. Shipping costs have remained elevated, and port congestion has had numerous effects that may have been hard to predict. California farmers, for instance, have been having a difficult time finding container capacity to export tree nuts, produce, and dairy products.

Of all the supply problems that have arisen during the pandemic, semiconductor shortages have had some of the most widespread effects. In many cases, semiconductors account for only a small part of a product's total cost. Yet they often have no close substitutes, making them indispensable to the production process. Because of this, semiconductor shortages can have an outsized effect on final-product supply shortages and the inflationary pressures they create. Recent research by economists at the St. Louis Fed indicated that the problem extended far beyond the auto industry to a broad range of other U.S. manufacturing industries. Comparing 56 industries that use semiconductors as a direct input with 170 industries that do not, they found substantially higher price changes in the semiconductor-dependent industries during 2021.

Additional research from the St. Louis Fed shows that price pressures tended to be greatest in U.S. industries with heightened exposure to foreign countries experiencing particularly severe supply bottlenecks, as measured by indexes of work backlogs and supplier delivery times. Some of the largest exposures were in the U.S. motor vehicles, petroleum, basic metals, and electrical equipment industries.

HOW MUCH INFLATION CAME FROM WHERE?

A natural question is the extent to which increased inflation is due to overly accommodative macroeconomic policies versus the supply-side shocks caused by the COVID-19 pandemic and, more recently, the war in Ukraine. The multiplicity of shocks and their staggered arrival times make this a difficult question to answer definitively.

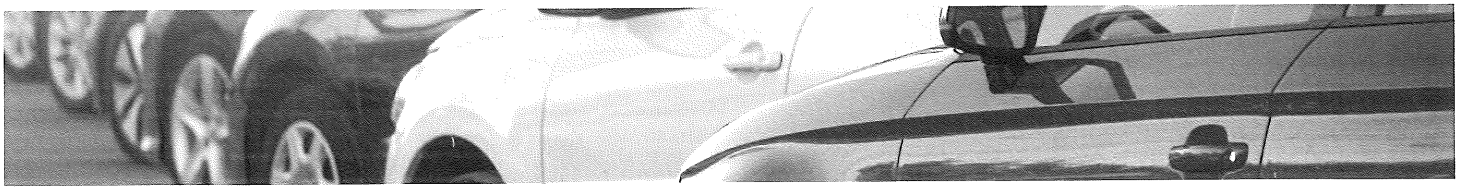
Researchers have responded to the challenge by taking a variety of approaches. One such effort was undertaken by the Richmond Fed's Alex Wolman in a recent working paper, "Relative Price Shocks and Inflation," which he co-authored with Francisco Ruge-Murcia of McGill University. Within the context of a more general analysis of the relationship between relative price shocks and inflation, the researchers presented a model that they used to break down the behavior of U.S. inflation from March 2021 through November 2021 into contributions from supply-side shocks versus overly accommodative monetary policy.

In the model, the monetary authorities do not attempt to stabilize the prices of individual goods and services, nor do they attempt to constrain overall inflation to an extremely narrow range in the short run. "If the relative price of used cars needs to go sky high because of supply disruptions, the way that's going to happen at first is for the prices of used cars to go sky high," says Wolman. "It's not going to happen by having the prices of all of the other goods in the economy decline all at once." Thus, sector-specific supply shocks can affect the economy-wide rate of inflation on a month-by-month basis, even under a monetary regime marked by low inflation and policy stability.

Over the model's long-term horizon, however, monetary policy does stabilize inflation. Although the central bank allows unusually large relative price shocks to pass through to inflation, those shocks are — by definition — unusual, so inflation tends to remain close to the Fed's target.

Wolman and Ruge-Murcia found that the inflationary increase during the period between March 2020 and November 2021 was roughly four-fifths due to supply-side shocks, with the single largest supply-side shock coming from the vehicle sector. Overly accommodative monetary policy explained the remaining one-fifth of the inflation overshoot. Although the model does not explicitly incorporate fiscal policy, Wolman believes that, in practice, their calculation of monetary policy's contribution to inflation most likely captures the combined inflationary contributions of both monetary *and* fiscal policy. "My view is that there was a big expansionary fiscal shock, and that if the Fed had followed its usual policy rule, it would have chosen a much higher interest rate than it actually did," says Wolman. "To the extent that the Fed did not raise rates in response to the fiscal stimulus, it's going to show up in our model as a monetary policy shock."

Recent research by economists at the New York Fed broadly concurs with Wolman's finding that the inflationary increase seen during 2021 owed much to supply-side factors



such as production and shipping bottlenecks and higher input prices. They also agreed in the assessment that loose monetary policy played a secondary role, concluding that the global nature of recent supply shocks suggests that "domestic monetary policy actions would have only a limited effect on these sources of inflationary pressures."

But these two studies come with an important caveat: They only cover the period through late 2021, when U.S. inflation was still behaving much like it had during 1995-2019 — a period of low and stable inflation in which relatively high monthly inflation readings were mostly accounted for by large price increases in a small share of goods and services. More recent data have deviated from this pattern. "Not only has inflation continued to be high," says Wolman, "it has also been associated with a larger share of goods with large price increases." To Wolman, this increased inflationary breadth raises concern that inflation may be becoming more of a monetary phenomenon and less a supply-side phenomenon.

Ana Maria Santacreu of the St. Louis Fed has taken a variety of approaches to understanding the recent increase in inflation. "We've done a lot of things from different angles," she says. "There's no one method that can tell us, 'how much is demand, and how much is supply?'" While some of her research has pointed to the importance of supply-side factors, she has also found evidence suggesting that expansionary fiscal policies have played an important role. She recently co-authored a working paper that examined recent increases in inflation across a sample of advanced and emerging economies. The researchers found that expansionary fiscal policies tended to increase consumption but had only a limited impact on the supply of goods as measured by industrial production indexes. "We take the results as evidence that fiscal policies contributed to inflationary mismatches between demand and supply," says Santacreu.

A MONETARY POLICY CONUNDRUM

Pinning down the precise sources of current inflationary pressure has important implications for policy. To the extent that increased inflation reflects overly stimulative policy, the antidote is apparent: Reverse course and revert to policies more consistent with past periods in which inflation was stabilized. To the extent that increased inflation reflects supply-side shocks, however, the usual tools of aggregate demand management are likely to offer little help.

In the wake of the global oil price shocks of the 1970s, economists devoted much effort to understanding the optimal monetary policy response to supply shocks. Unfortunately, however, the consensus conclusion was that the standard tools of monetary and fiscal policy are not well designed to address supply shocks. Edward Gramlich of the University of Michigan provided a summary of this viewpoint in a 1979 article that appeared in *Brookings Papers on Economic Activity*. He concluded that supply shocks are very costly, no matter what the policy response: "If their unemployment impact is minimized by accommodating policies, the shock-induced inflation can linger for several years. If their inflationary impact is minimized by an immediate recession, the cost in terms of high unemployment is sizable."

As a practical matter, economists have often advocated some degree of accommodation in response to aggregate supply shocks. But the prescription for accommodation typically rests on the assumption of an economy initially at equilibrium — that is, one with stable inflation and full employment. While that was likely the case at the onset of the pandemic, it certainly was not the case when global energy and grain supplies were disrupted at the onset of the war in Ukraine. Indeed, year-over-year U.S. inflation had already hit a nearly 40-year record before that point.

While monetary policy is generally not an effective avenue for alleviating supply shocks, companies and governments are likely to take measures designed to soften such blows in the future. Undoubtedly, changing perceptions of risk will cause some firms to reassess their supply chains, just as Japanese automakers did after their supply networks were heavily disrupted by the 2011 Tōhoku earthquake. Indeed, even before the pandemic, many companies had been already reassessing their reliance on foreign value chains, due to, among other things, increased labor costs in China and the growing importance of "speed-to-market" as a competitive factor.

Calls for government policies to decrease dependency on global supply chains have come from many circles in the United States, Europe, and Japan. Treasury Secretary Janet Yellen, for example, has raised the prospect of "friend- shoring" policies. Similarly, officials from France and Germany have spoken of "reshoring projects" and "minimizing one-sided dependencies." Within the United States, the costs and benefits of such policies will continue to be debated among researchers and politicians, while Fed officials focus on the appropriate extent of monetary tightening or accommodation. **EF**

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What Can We Learn from the Pandemic and the War about Supply Shocks, Inflation, and Monetary Policy?

Remarks by

Lael Brainard

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Board of Governors of the Federal Reserve System

Prepared for the conference volume of the

21st BIS Annual Conference
Central Banking after the Pandemic: Challenges Ahead

Bank for International Settlements
Basel, Switzerland

Policymakers and researchers have begun reassessing certain features of the economy and monetary policy in light of recent experience. After several decades in which supply was highly elastic and inflation was low and relatively stable, a series of supply shocks associated with the pandemic and Russia's war against Ukraine have contributed to high inflation, in combination with a very rapid recovery in demand. The experience with the pandemic and the war highlights the challenges for monetary policy in responding to a protracted series of adverse supply shocks. In addition, to the extent that the lower elasticity of supply we have seen recently could become more common due to challenges such as demographics, deglobalization, and climate change, it could herald a shift to an environment characterized by more volatile inflation compared with the preceding few decades.[1]

Inflation in the United States and many countries around the world is very high (figure 1). While both demand and supply are contributing to high inflation, it is the relative inelasticity of supply in key sectors that most clearly distinguishes the pandemic- and war-affected period of the past three years from the preceding 30 years of the Great Moderation.[2] Interestingly,

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[1] I am grateful to Kurt Lewis of the Federal Reserve Board for his assistance in preparing this text and to Kenneth Eva for preparing the figures. This text updates the views that I discussed as part of a panel at the BIS Annual Meeting on June 24, 2022. These views are my own and do not necessarily reflect those of the Federal Reserve Board or the Federal Open Market Committee.

[2] Research has generated a range of estimates on the contributions from supply and demand factors. For example, Shapiro (2022) finds that demand factors are responsible for about one-third of the surge in inflation above the pre-pandemic trend, while di Giovanni and others (2022) find a number closer to two-thirds. See Adam Shapiro (2022), "How Much Do Supply and Demand Drive Inflation?" FRBSF Economic Letter 2022-15 (San Francisco: Federal Reserve Bank of San Francisco, June), https://www.frbsf.org/economic-research/publications/economic-letter/2022/june/how-much-do-supply-and-demand-drive-inflation; and Julian di Giovanni, Sebnem Kalemli-Ozcan, Alvaro Silva, and Muhammed Yildirim (2022), "Global Supply Chain Pressures, International Trade, and Inflation," paper presented at the ECB Forum on Central Banking 2022, Sintra, Portugal, June 27–29, https://www.ecb.europa.eu/pub/conferences/ecbforum/shared/pdf/2022/Kalemli-Oezcan_paper.pdf.

inflation is broadly higher throughout much of the global economy, and even jurisdictions that began raising rates forcefully in 2021 have not stemmed the global inflationary tide.[3]

In the United States, as a result of significant fiscal and monetary support, the level of private domestic final purchases recovered extremely rapidly in 2020 and 2021 to levels consistent with the pre-pandemic trend before moving below trend in 2022 (figure 2). Although demand came in near the pre-pandemic trend on an aggregate level, the pandemic induced a shift in composition that concentrated large increases in demand in certain sectors where the supply response was constrained. The shift in consumption from services to goods was so pronounced that—despite plunging at the onset of the pandemic in March 2020—real spending on goods had already risen nearly 4 percent above its pre-pandemic trend by June of that year. While a very slow rotation back toward pre-pandemic patterns of consumption has been under way for over a year, it remains incomplete more than two and a half years after the initial shutdown: In the most recent data, the level of goods spending remains 6 percent above the level implied by its pre-pandemic trend, while services spending remains a little more than 2 percent below its pre-pandemic trend (figure 3).

The supply shocks to goods, labor, and commodities have been accompanied by unusually high volatility in monthly inflation readings since the beginning of the pandemic. Since March 2020, the standard deviation of month-over-month core inflation has been 0.22 percentage point—a level of variation not seen in a 31-month period since the 1970s and more than double the standard deviation in monthly core inflation from 1990 to 2019. The initial

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[3] The median year-to-date total policy rate hike within the group of Brazil, Hungary, New Zealand, Norway, Peru, Poland, and South Korea is 6 percentage points. All of these countries began forceful rate hikes in 2021, and the cumulative hikes have taken policy rates in some of these countries above 10 percent. Despite this, through September 2022 core inflation in these countries was 9.5 percent year-over-year, rising 3.5 percentage points since March. See Economist (2022), "Even Super-Tight Policy Is Not Bringing Down Inflation," October 28, https://www.economist.com/finance-and-economics/2022/10/23/even-super-tight-policy-is-not-bringing-down-inflation.

drivers of this high variation in monthly core inflation readings were a sharp drop in prices and subsequent bounceback in the first months of the pandemic, followed by a couple of bursts lasting three to four months each. The first burst occurred around reopening in the spring of 2021, and the second occurred amid the effects of the Delta and Omicron COVID-19 variants in the autumn of 2021 (figure 4).[4]

The evidence suggests that high concentrations of demand in sectors such as appliances, housing, and motor vehicles—where supply was constrained by the effects of the pandemic—played an important role initially in generating inflationary pressures. Acute constraints on shipping and on the supply of nonsubstitutable intermediate inputs like semiconductors were compounded by acute constraints on labor supply associated with the effects of the Delta and Omicron variants and later compounded further by sharp commodities supply shocks associated with Russia's war on Ukraine.

The standard monetary policy prescription is to "look through" supply shocks, such as commodities price shocks or shutdowns of ports or semiconductor plants, that are not assessed to leave a lasting imprint on potential output.[5] In contrast, if supply shocks durably lower potential output such that the economy is operating above potential, monetary policy tightening is necessary to bring demand into alignment with the economy's reduced productive capacity.

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[4] Pandemic fiscal measures played an important role in boosting demand, but the rapid deceleration of inflation over the summer of 2021 and subsequent rebound in inflation from October through the end of the year do not line up well with the fiscal demand impulse projected by most forecasters. For example, the Brookings Institution projected a smooth demand impulse from the American Rescue Plan that peaked at the end of last year. See Wendy Edelberg and Louise Sheiner (2021), "The Macroeconomic Implications of Biden's $1.9 Trillion Fiscal Package," Brookings Institution, *Up Front* (blog), January 28, https://www.brookings.edu/blog/up-front/2021/01/28/the-macroeconomic-implications-of-bidens-1-9-trillion-fiscal-package.

[5] See, for instance, Martin Bodenstein, Christopher J. Erceg, and Luca Guerrieri (2008), "Optimal Monetary Policy with Distinct Core and Headline Inflation Rates," *Journal of Monetary Economics,* vol. 55 (October), pp. S18–33.

Importantly, and separately from the implications for potential output, monetary policy should respond strongly if supply shocks risk de-anchoring inflation expectations.[6]

Although these tenets of monetary policy sound relatively straightforward in theory, they are challenging to assess and implement in practice. It is difficult to assess potential output and the output gap in real time, as has been extensively documented by research.[7] This is especially true in an environment of high uncertainty. The level of uncertainty around the output gap varies considerably over time, and research suggests that more muted policy reactions are warranted when uncertainty about the output gap is high.[8] The unexpectedly long-lasting global pandemic and the sharp disruptions to commodities associated with Russia's war against Ukraine have contributed to substantial uncertainty (figure 5).

Even so, the drawn-out sequence of shocks to the supply of labor, commodities, and key intermediate inputs, such as semiconductors, blurred the lines about what constitutes a temporary shock as opposed to a persistent shock to potential output. Even when each individual supply shock fades over time and behaves like a temporary shock on its own, a drawn-out sequence of adverse supply shocks that has the cumulative effect of constraining potential output for an extended period is likely to call for monetary policy tightening to restore balance between demand and supply.

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[6] Ricardo Reis makes the case that both these factors would have prescribed tighter policy in the current environment. See Ricardo Reis (2022), "The Burst of High Inflation in 2021–22: How and Why Did We Get Here?" CEPR Discussion Paper Series DP17514 (London: Centre for Economic Policy Research, July), https://cepr.org/publications/dp17514.

[7] See Athanasios Orphanides and Simon van Norden (2002), "The Unreliability of Output-Gap Estimates in Real Time," *Review of Economics and Statistics,* vol. 84 (November), pp. 569–83.

[8] For discussions of the time-varying nature of output gap uncertainty, see Travis J. Berge (2020), "Time-Varying Uncertainty of the Federal Reserve's Output Gap Estimate," Finance and Economics Discussion Series 2020-012 (Washington: Board of Governors of the Federal Reserve System, February; revised April 2021), https://doi.org/10.17016/FEDS.2020.012r1; and Rochelle M. Edge and Jeremy B. Rudd (2016), "Real-Time Properties of the Federal Reserve's Output Gap," *Review of Economics and Statistics,* vol. 98 (October), pp. 785–91. For a discussion of tempering the policy response to the output gap in response to increased uncertainty, see Athanasios Orphanides (2003), "Monetary Policy Evaluation with Noisy Information," *Journal of Monetary Economics,* vol. 50 (April), pp. 605–31.

In addition, a protracted series of supply shocks associated with an extended period of high inflation—as with the pandemic and the war—risks pushing the inflation expectations of households and businesses above levels consistent with the central bank's long-run inflation objective.[9] It is vital for monetary policy to keep inflation expectations anchored, because inflation expectations shape the behavior of households, businesses, and workers and enter directly into the inflation process. In the presence of a protracted series of supply shocks and high inflation, it is important for monetary policy to take a risk-management posture to avoid the risk of inflation expectations drifting above target. Even in the presence of pandemics and wars, central bankers have the responsibility to ensure that inflation expectations remain firmly anchored at levels consistent with our target.

In monitoring inflation expectations for purposes of risk management, not only the median but also the distribution of inflation expectations can provide important information about how inflation expectations may be changing.[10] Survey measures suggest that the median of longer-term inflation has remained within pre-pandemic ranges consistent with 2 percent inflation (figure 6). However, starting in 2021, there has been a greater dispersion than usual of views about future inflation in survey responses, as shown in figure 6. Although initially the increased dispersion reflected a rise in expectations for significantly above-target inflation, more

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[9] For two recent examples of assessing longer-term inflation expectations, see Michael T. Kiley (2022), "Anchored or Not: How Much Information Does 21st Century Data Contain on Inflation Dynamics?" Finance and Economics Discussion Series 2022-016 (Washington: Board of Governors of the Federal Reserve System, March), https://doi.org/10.17016/FEDS.2022.016; and Danilo Cascaldi-Garcia, Francesca Loria, and David López-Salido (2022), "Is Trend Inflation at Risk of Becoming Unanchored? The Role of Inflation Expectations," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, March 31), https://doi.org/10.17016/2380-7172.3043.

[10] See, for example, Ricardo Reis (2021), "Losing the Inflation Anchor," *Brookings Papers on Economic Activity*, Fall, pp. 307–61, https://www.brookings.edu/wp-content/uploads/2021/09/15985-BPEA-BPEA-FA21_WEB_Reis.pdf. The Board's staff recently updated the Index of Common Inflation Expectations to include the 25th and 75th percentiles of inflation expectations over the next 12 months from the University of Michigan Surveys of Consumers.

recently, following substantial cumulative monetary policy tightening, the increased dispersion has also reflected increased expectations of no inflation or even disinflation. About one-fourth of respondents to the most recent University of Michigan Surveys of Consumers anticipate that prices are likely to be the same or below their current level 5 to 10 years in the future—roughly three times the average fraction that reported such expectations before the pandemic.

Finally, it is important to explore whether any features of the inelastic supply response associated with the pandemic and the war may have implications for potential growth and macroeconomic stability in the future.[11] In particular, despite the unprecedented pandemic policy support for businesses of all sizes that was directed at preserving the supply side of the economy, key sectors struggled to ramp up activity after reopening. The supply response was particularly impaired in sectors where supply chains are geographically fragmented and recurring foreign COVID-19 lockdowns have reduced the reliability of foreign supplies. While conditions have improved dramatically from some of the worst periods in 2021, measures like the Global Supply Chain Pressure Index from the Federal Reserve Bank of New York indicate that total supply chain pressures still are elevated relative to pre-pandemic levels (figure 7).

The supply disruptions in key goods and commodities sectors associated with the pandemic and Russia's war against Ukraine have highlighted the fragility of global supply chains and the risks of inelastic supply at moments of stress. Conditions have improved dramatically over the past year, judging by the return of the ISM Supplier Deliveries index to its pre-pandemic range of values (figure 8). That said, ongoing discussions about moving from "just in time" to "just in case" inventory management and from offshoring to "nearshoring" are raising

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[11] See, for example, Agustín Carstens (2022), "The Return of Inflation," speech delivered at the International Center for Monetary and Banking Studies, Geneva, April 5, https://www.bis.org/speeches/sp220405.htm.

important questions about the extent to which businesses are likely to reconfigure global supply chains based on a reassessment of the tradeoff between cost efficiency and supply resilience.

Similarly, some have conjectured that the slow and incomplete recovery of the workforce over the course of the pandemic may be the beginning of a longer-term change in labor supply dynamics (figure 9).[12] In addition, the potential for more frequent and severe climate events, as we are already seeing, and for frictions in the energy transition could also lead to greater volatility of supply. Together, a combination of forces—the deglobalization of supply chains, the higher frequency and severity of climate disruptions, and demographic shifts—could lead to a period of lower supply elasticity and greater inflation volatility.

To conclude, the experience with the pandemic and the war highlights challenges for monetary policy in responding to supply shocks. A protracted series of adverse supply shocks could persistently weigh on potential output or could risk pushing inflation expectations above target in ways that call for monetary policy to tighten for risk-management reasons. More speculatively, it is possible that longer-term changes—such as those associated with labor supply, deglobalization, and climate change—could reduce the elasticity of supply and increase inflation volatility into the future.

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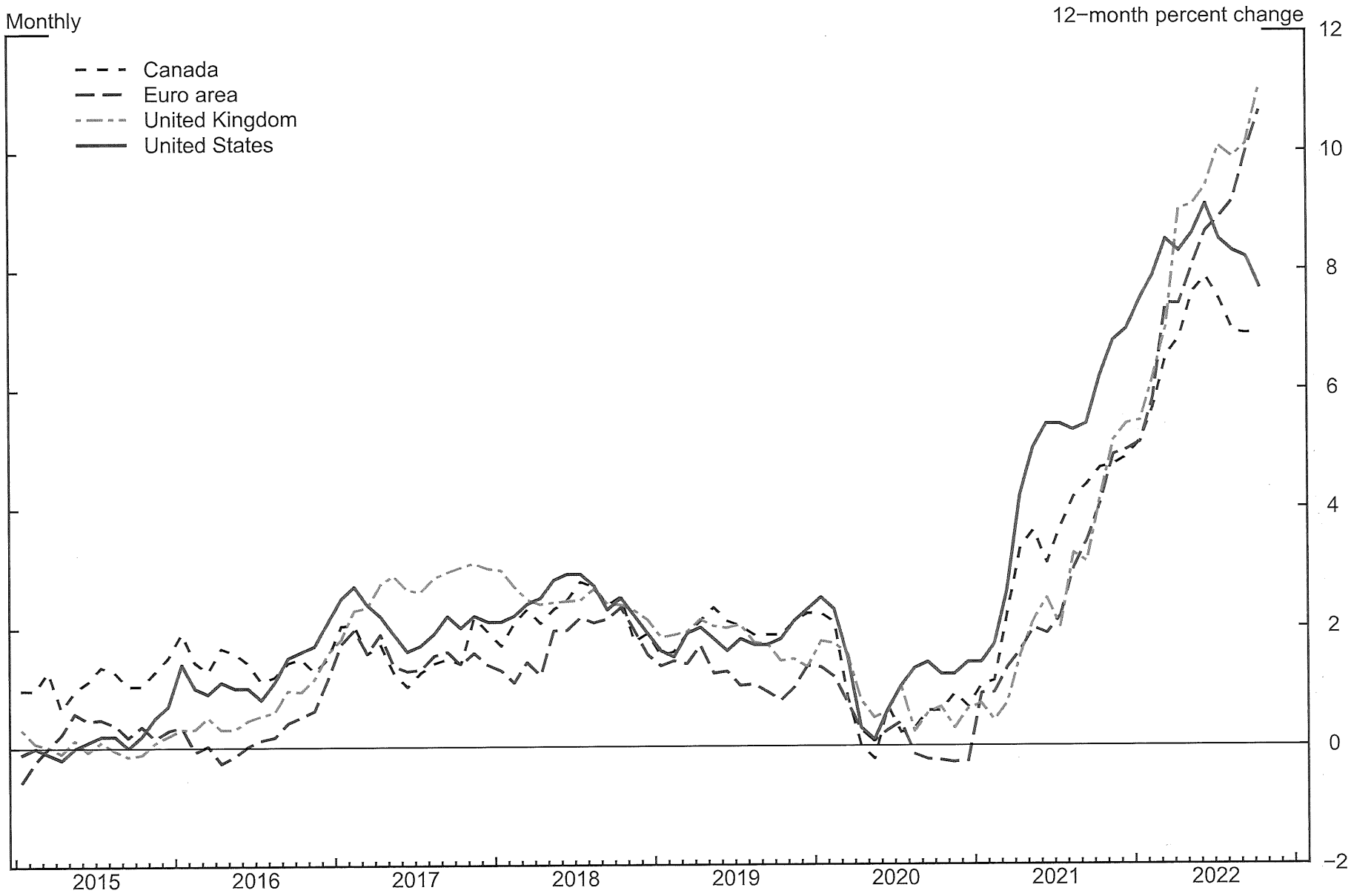
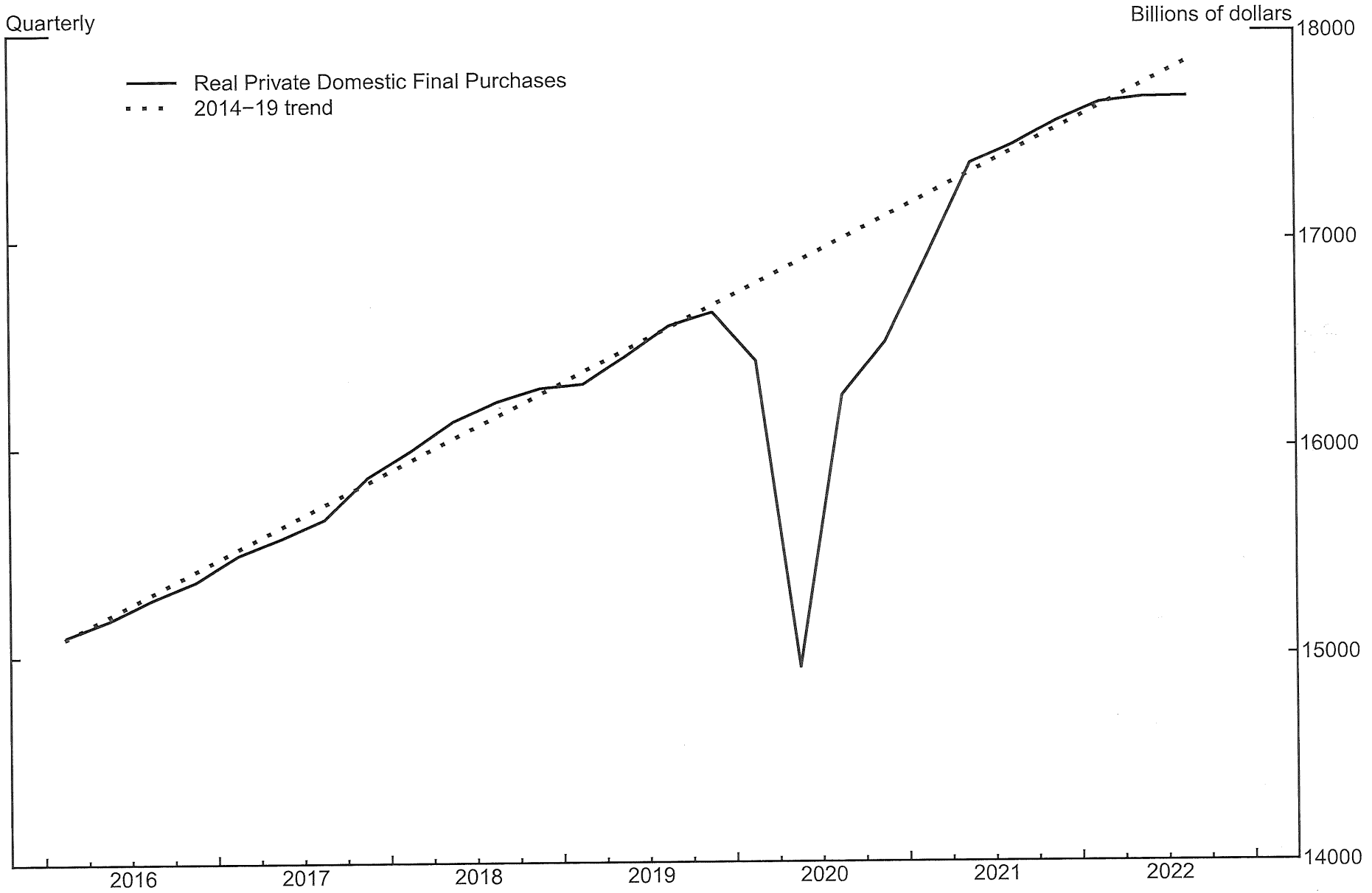
[12] See, for example, Charles Goodhart and Manoj Pradhan (2020), *The Great Demographic Reversal: Ageing Societies, Waning Inequality, and an Inflation Revival* (Cham, Switzerland: Palgrave Macmillan).

Figure 1. Headline Inflation for Selected Countries



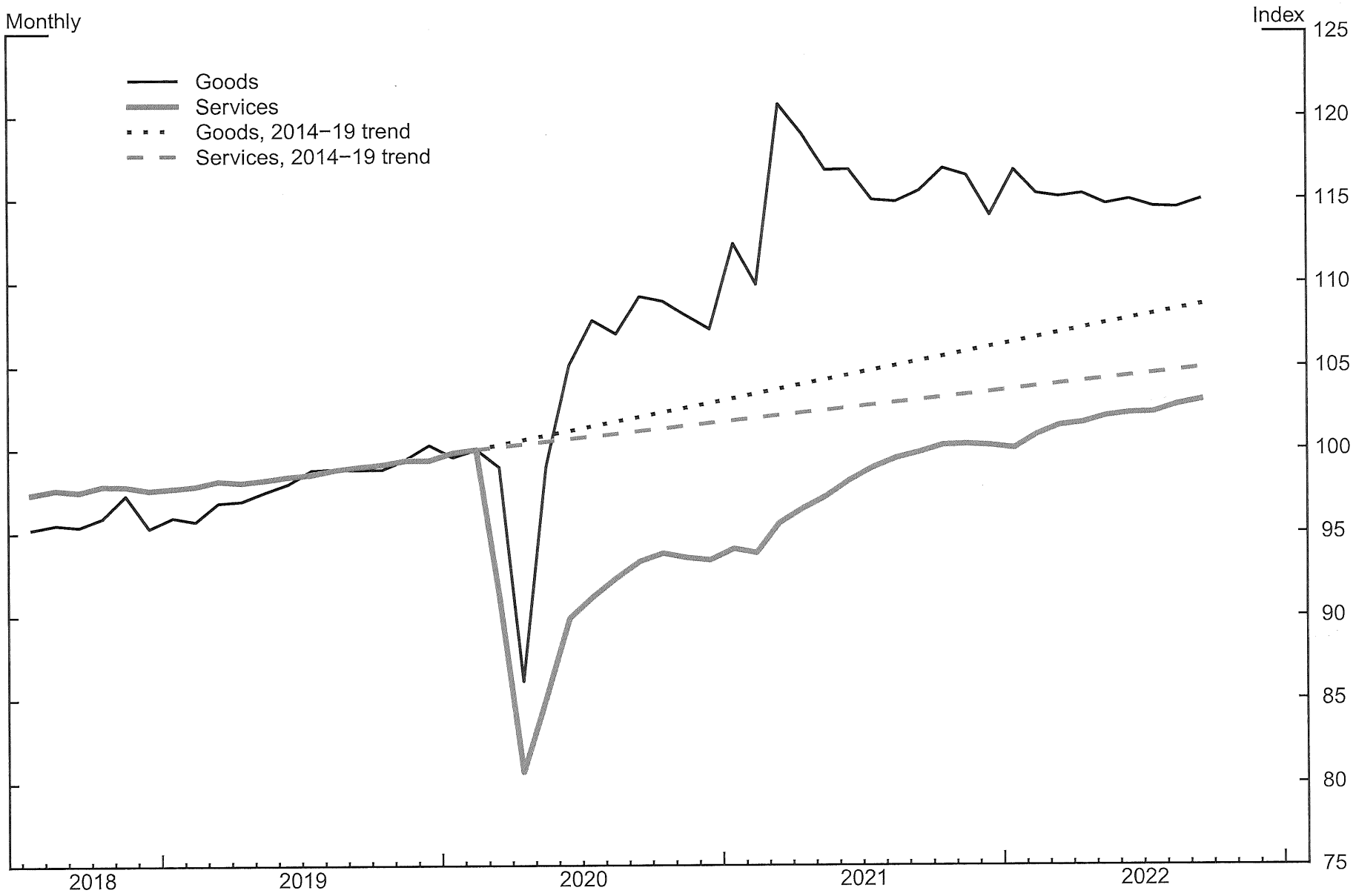
Note: Data go through October 2022.
Source: Haver Analytics.

Figure 2. Real Private Domestic Final Purchases



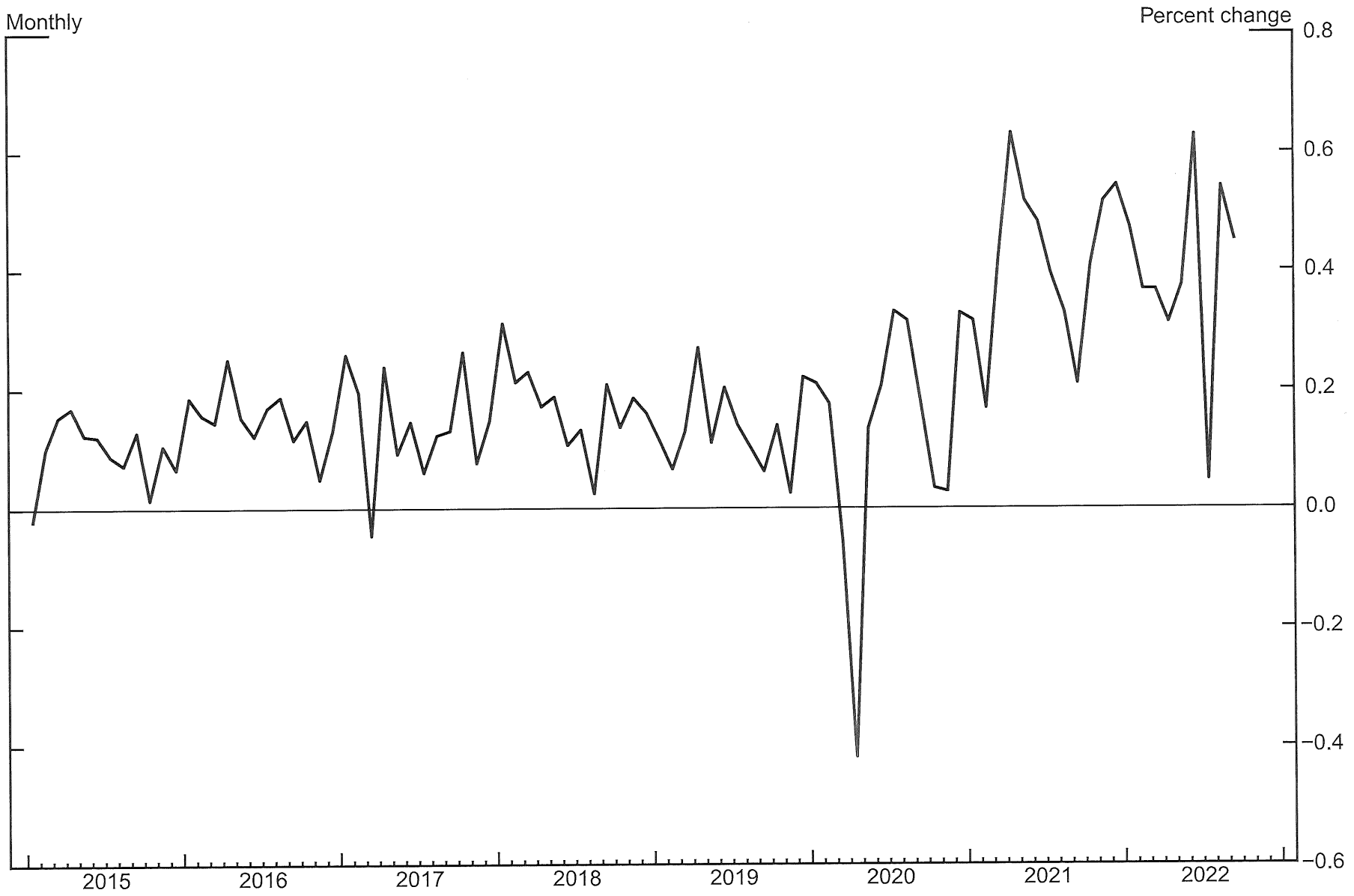
Note: Data go through 2022:Q3.
Source: Bureau of Economic Analysis.

Figure 3. Real Personal Consumption Expenditures



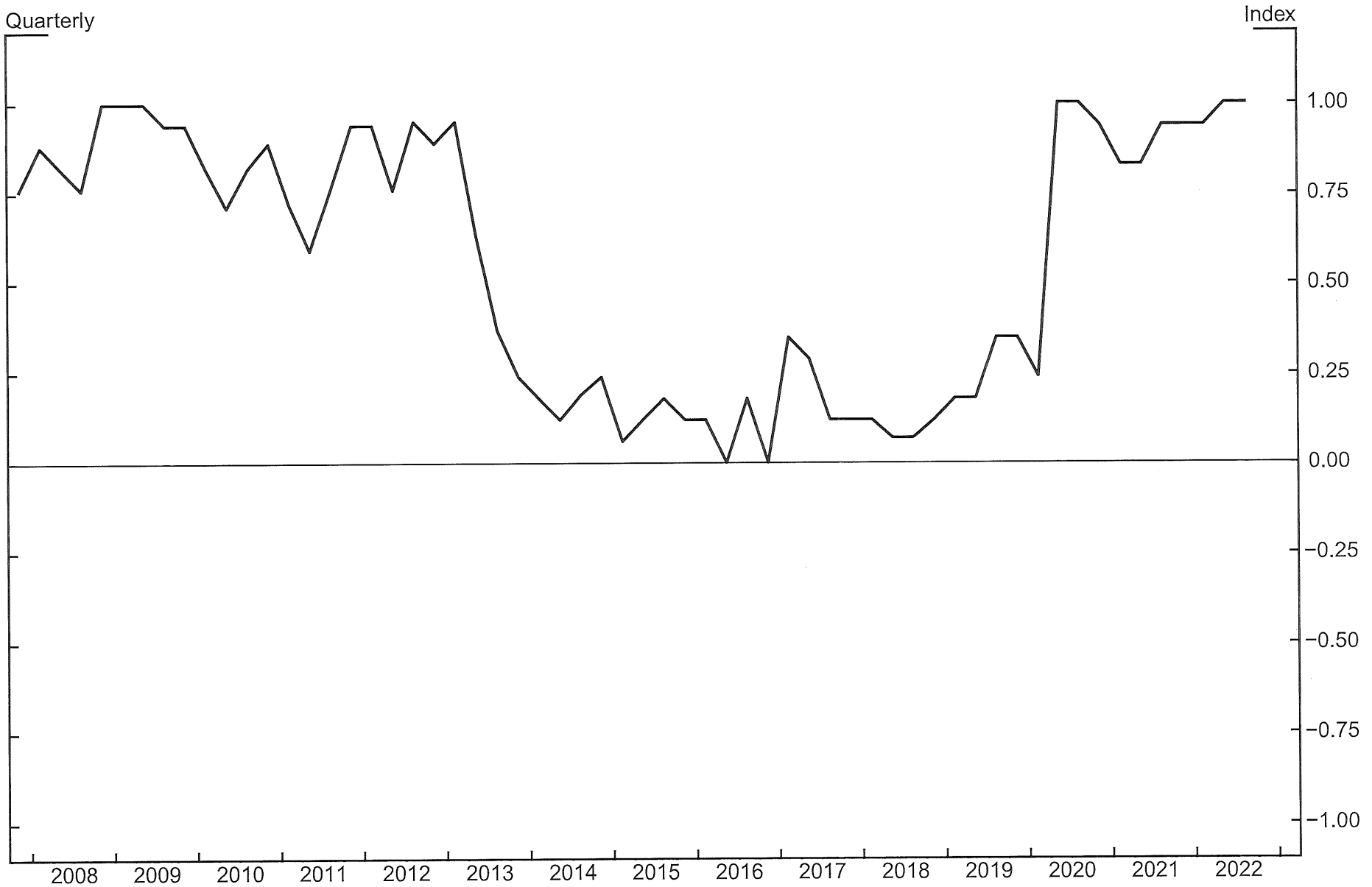
Note: Data go through September 2022.
Source: Bureau of Economic Analysis.

Figure 4. PCE Monthly Inflation Less Food and Energy



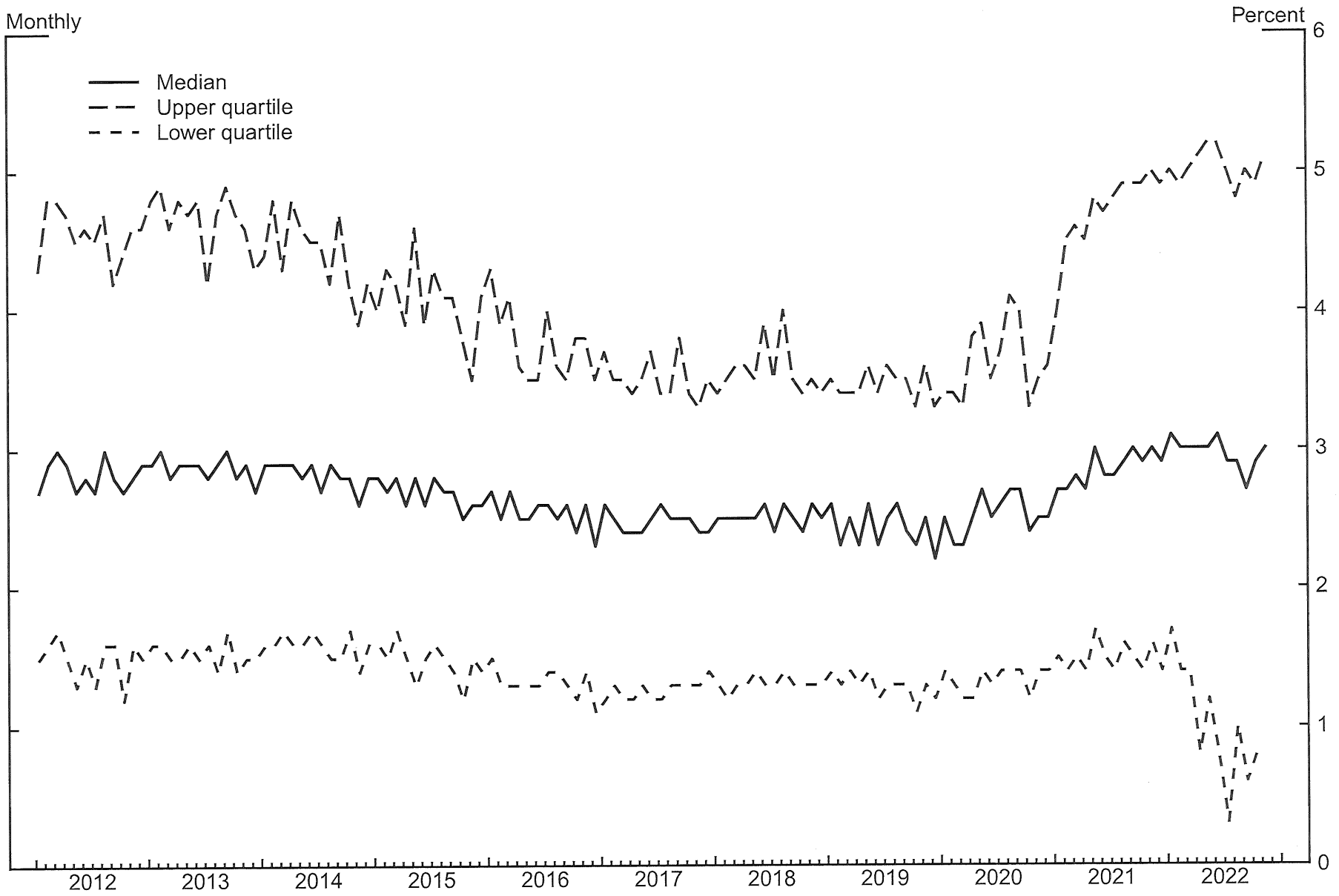
Note: Data go through September 2022. PCE is personal consumption expenditures.
Source: Bureau of Economic Analysis.

Figure 5. Diffusion Index of FOMC Participants' Uncertainty Assessments for GDP Growth



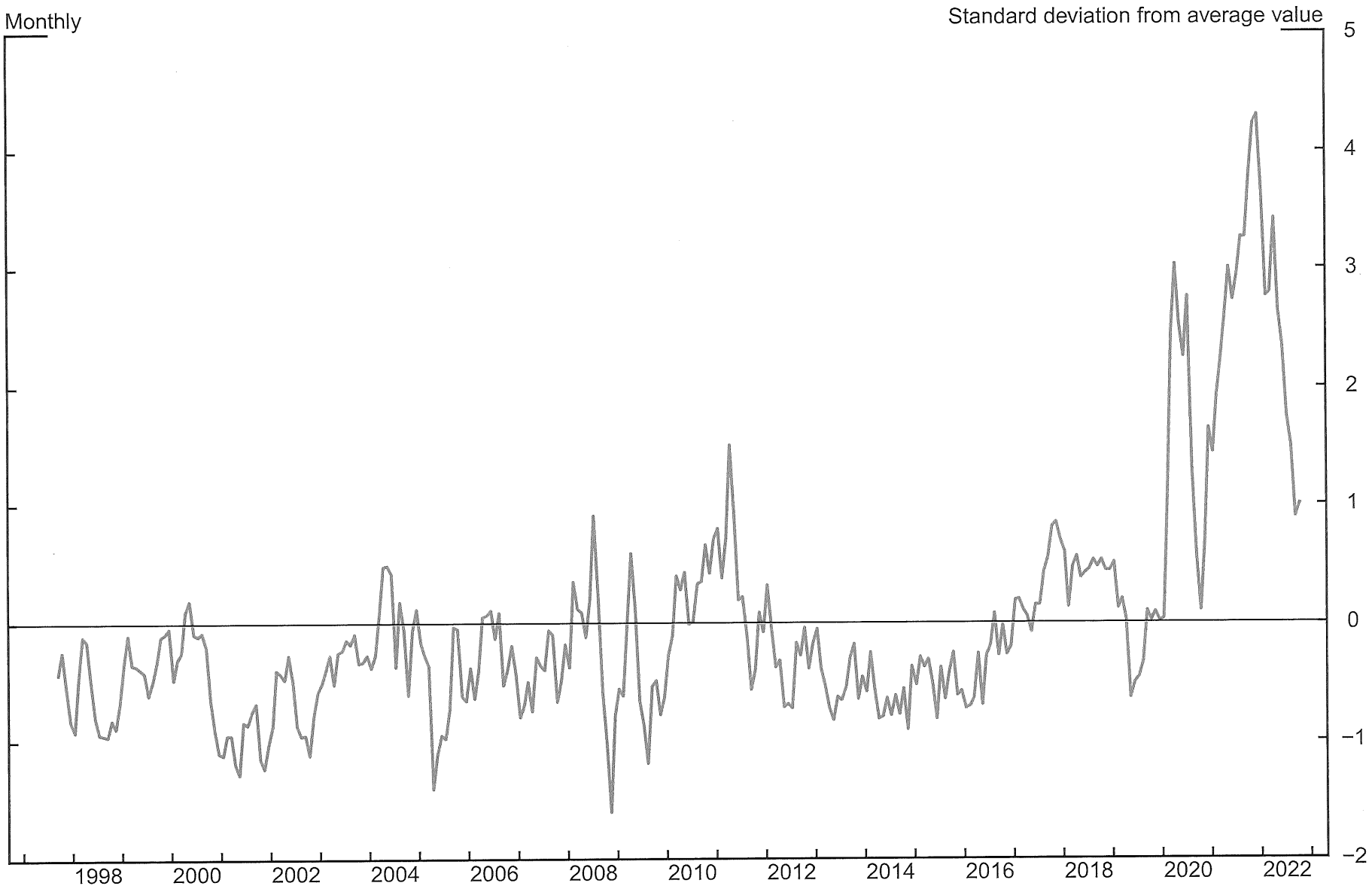
Note: Data go through 2022:Q3. FOMC is Federal Open Market Committee; GDP is gross domestic product.
Source: Federal Reserve Board.

Figure 6. Expected Price Change, Next 5 to 10 Years



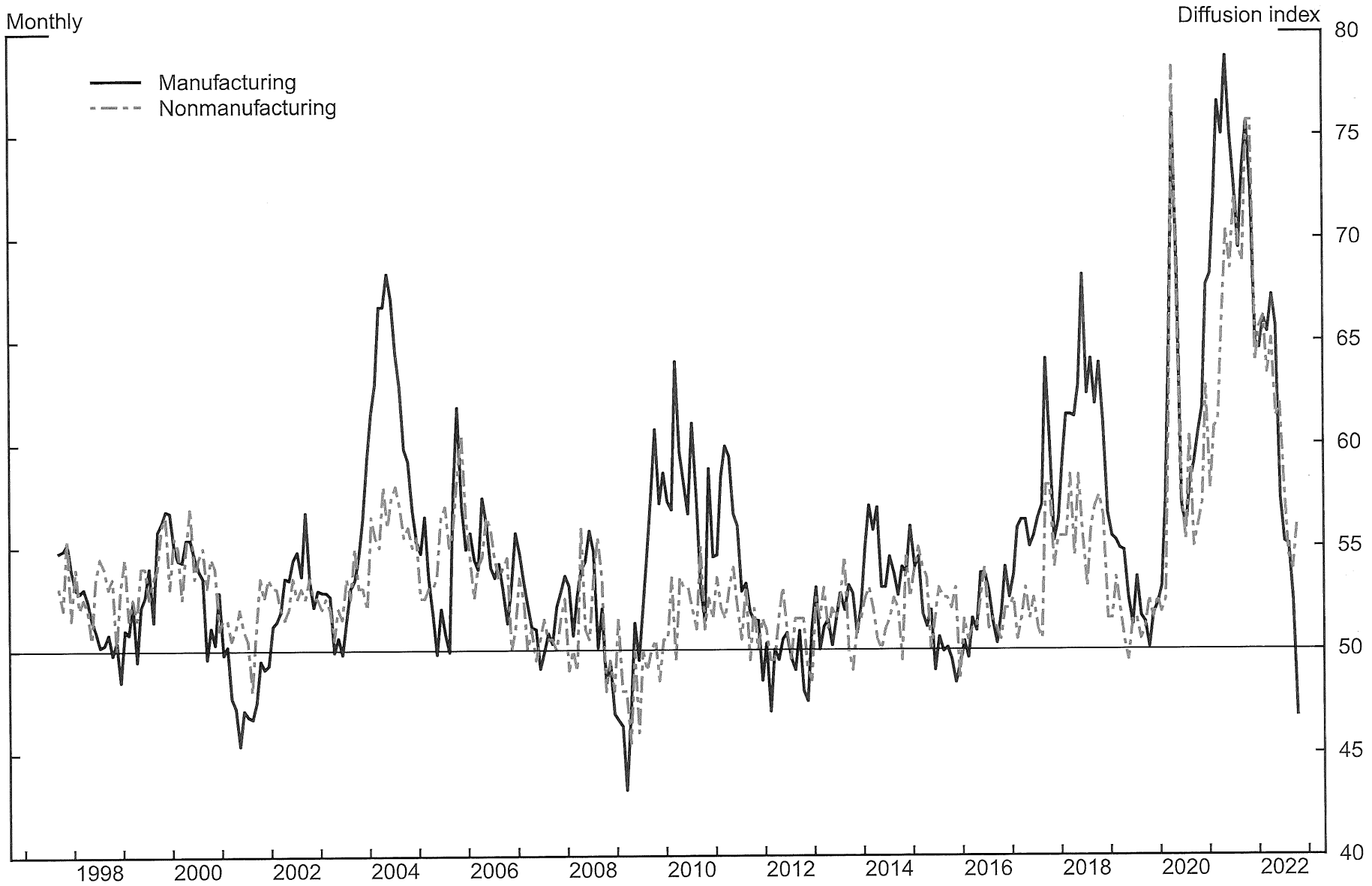
Note: Data go through November 2022.
Source: University of Michigan Surveys of Consumers.

Figure 7. Global Supply Chain Pressure Index



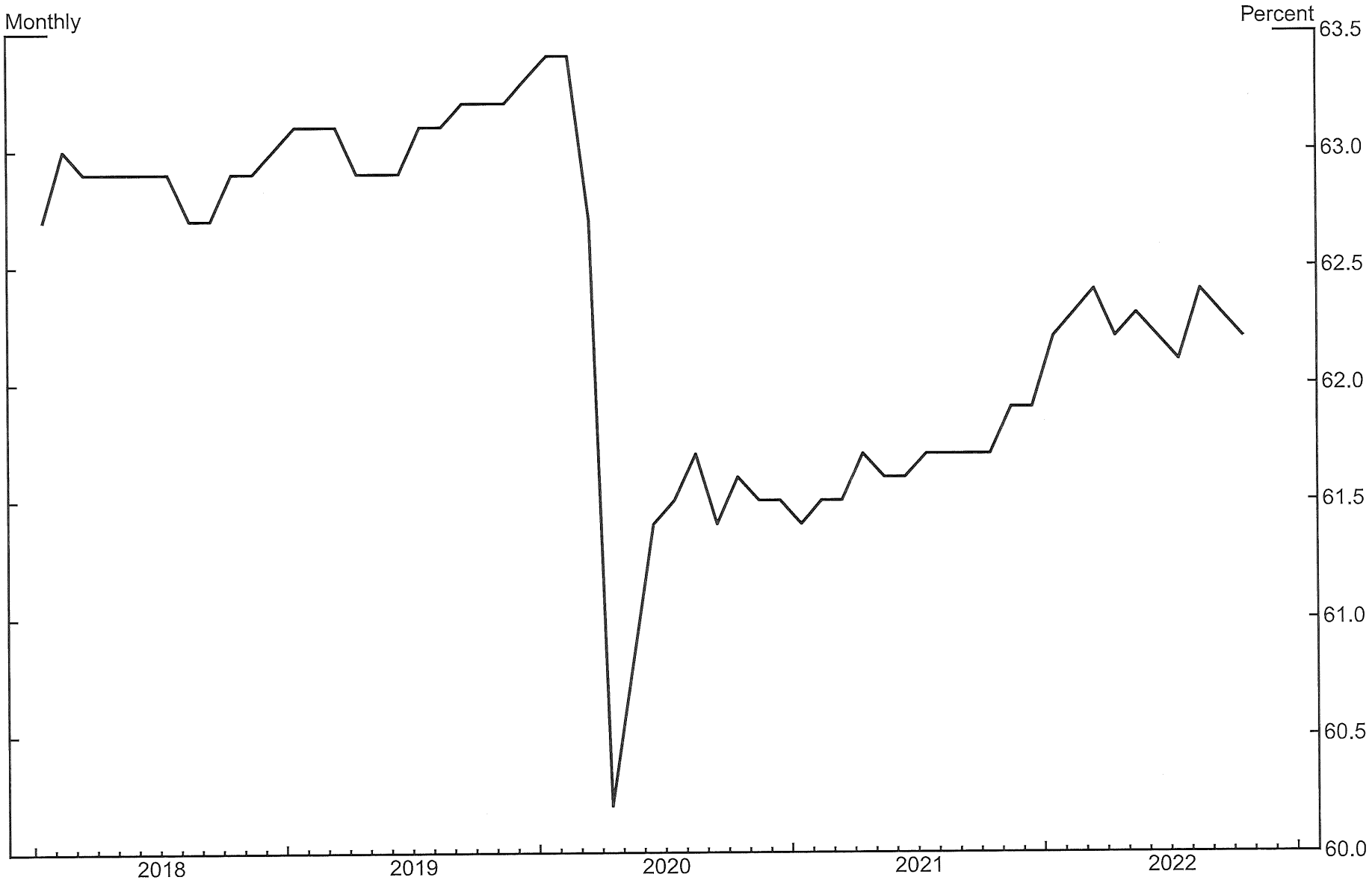
Note: Data go through October 2022.
Source: Federal Reserve Bank of New York.

Figure 8. ISM Supplier Deliveries Index



Note: Data go through October 2022. The ISM Supplier Deliveries Index is an inverse diffusion index, a reading above 50 percent indicates slower deliveries.
Source: Institute for Supply Management.

Figure 9. Labor Force Participation Rate



Note: Data go through October 2022.
Source: Bureau of Labor Statistics.

FRBSF Economic Letter

Research from
the Federal Reserve
Bank of San Francisco

2024-05 | February 20, 2024

Price Stability Built to Last

Mary C. Daly

The economy is healthy and price stability is within sight. But progress is not victory, and considerable uncertainty and risks remain. To finish the job will take fortitude and patience, along with the agility to respond as the economy evolves. The following is adapted from the keynote address by the president of the Federal Reserve Bank of San Francisco at the 40th Annual NABE Economic Policy Conference in Washington, DC, on February 16.

The day after the December Federal Open Market Committee (FOMC) meeting, just a few months back, a man came up to me in the dry cleaner. He told me that he and his wife had gone to dinner the night before, partly to celebrate the end of the Fed's rate tightening cycle, but mostly to mark the end of the long, hard battle to bring inflation down. He felt the worst was behind us, and that he and his family could finally take a breath.

The relief he described is not unique. I hear it everywhere. Businesses, communities, and families exhaling, just a bit, as they see inflation falling without the economy breaking.

There is no doubt things are better. But progress is not victory, and we, the FOMC, need to deliver more than a few fleeting moments of relief.

Our goals are sustainable price stability and full employment, working together in a balance that will last. There is more work to do to deliver on that commitment.

Today, I will discuss the progress we have made, the risks we face, and what we will need to do to finish the job.

Significant progress

So, let's start with progress. Relative to a year ago, the economy is in a very good place. Inflation is heading down, the labor market is rebalancing, and many of the post-pandemic disruptions are dissipating.

The inflation progress has been remarkable. In the December 2023 release of personal consumption expenditures (PCE) inflation, prices were up just 2.6% compared to a year ago. Still not price stability, but a lot of improvement from its peak of 7.1% back in June 2022.

A big part of the story on inflation has been supply. Global production, warehousing, and distribution networks have largely returned to normal. Bottlenecks, wait times, and price pressures have followed (see New York Fed's Global Supply Chain Pressure Index for the latest data and Liu and Nguyen 2023 for analysis).

These things aren't surprising. They've just finally happened. And they've helped ease goods price inflation substantially, bringing it back to near pre-pandemic levels.

The supply-side surprise, if you will, has been the positive news on labor and productivity. Defying all the pessimists, U.S. workers in the prime of their working age came back to work last year, including women and mothers. This drove prime-age participation to its highest level in two decades. Labor force participation surged for prime-age workers through mid-2023, reaching a historical high for women and reattaining the pre-pandemic peak for men (Prabhakar and Valletta 2024). At the same time, we saw a surge in immigration. The share of foreign-born people in the U.S. labor force reached a new high in 2022, at 18.1% (Bureau of Labor Statistics 2023). Both of these developments boosted labor availability.

But we didn't just have more workers, these workers also became more productive. Productivity growth picked up notably last year, surpassing its pre-pandemic trend. Productivity growth in 2023 was 2.7%. By comparison, estimated trend productivity growth prior to the pandemic was between 1 and 1¼% (Fernald and Li 2019).

Together, these supply developments eased labor market tightness and helped to bring wage inflation closer to a level consistent with our 2% inflation target. That level is estimated to be about 3½% (see, for example, Almuzara, Audoly, and Melcangi 2023).

But perhaps the best news about the decline in inflation is that supply wasn't the only story. Improvement also has come from a gradual slowing in demand, the portion that monetary policy directly affects.

We hear this from our contacts and see it in surveys, but we can also quantify it using analysis developed at the San Francisco Fed (Shapiro 2022a, b). The researchers focus on the PCE index and separate individual price changes into those driven by demand, where prices and quantities move in the same direction, from those driven by supply, where prices and quantities move in opposite directions. Their analysis shows that about two-thirds of the decline in core inflation in 2023 came from the demand side. Demand played less of a role for headline PCE, where supplies of food and energy drive a lot of the inflation dynamic (see Supply- and Demand-Driven PCE Inflation and Shapiro 2022a, b; similarly, Guerrieri et al. 2023 argue that the rise and fall of energy prices in both the United States and the euro area played an important role in shaping observed inflation patterns after the pandemic).

Putting all of this together, it is clear that things changed in 2023. Supply bounced back, tighter monetary policy gained traction, and inflation came down rapidly. For households and businesses, the treadmill of persistently high and rising inflation slowed down. All without a significant decline in growth or employment.

This is unequivocally good news, and real progress.

Minding the risks

The question is should we expect it to continue. The modal outlook of many professional forecasters seems to say yes (see, for example, the February 2024 Blue Chip Economic Indicators). The median of the December FOMC Summary of Economic Projections portrayed a similar view (Board of Governors 2023).

Most striking perhaps is the confidence that households, businesses, and markets show for continued progress on inflation. Among households, once elevated year-ahead inflation expectations have fallen substantially and are now near pre-pandemic levels. In the Michigan survey, year-ahead inflation expectations eased to 2.9% in January, the lowest value since December 2020 and within the 2.3 to 3.0% range reported during the two years prior to the pandemic. In the New York Fed's Survey of Consumer Expectations, one-year inflation expectations were 3.0% in January, similar to their level in 2018 through early 2019. Business inflation expectations have also improved. According to the Atlanta Fed Inflation Project, businesses see prices in the coming year rising just slightly above 2%, about the norm for that series (see the Atlanta Fed's Business Inflation Expectations survey). Financial markets have similar expectations—inflation around 2% at the end of the year (based on updated analysis from Mertens and Zhang 2023).

Of course, projections and expectations are just that: views about what we think *will* happen. We need more time and data to be sure that they will be realized. And we need to monitor risks that could get in the way, especially since uncertainty is so high.

There is a myriad of risks to consider, but I will focus on two: slower inflation progress and fragilities in the labor market.

On inflation, there is a risk that the positive supply developments we saw last year might be hard to sustain. Labor force participation for prime-age workers is close to historical highs, and with the labor market cooling and wage gains slowing, we might not see additional outsized contributions coming from this group (Prabhakar and Valletta 2024). The large influx of foreign-born workers also may slow, further limiting labor force growth (for example, the Congressional Budget Office (2024) expects immigration flows to be little changed in 2024 and then decline somewhat in 2025–26, returning to historic averages after that). I always bet on workers, but at this point, it is hard to predict, and it does pose a risk to further rapid reductions in inflation.

The same is true of productivity growth. It's highly uncertain whether we will continue to see the strong numbers of last year. There are many reasons to be optimistic, but productivity trends are notoriously hard to forecast, and at this point, we just can't be sure.

And of course, we live in a dynamic world, and there are always new shocks, like disruptions in the Red Sea and Panama Canal, to disrupt supply. I know this was a concern mentioned in the NABE survey (see NABE

Economic Policy Survey: February 2024). Although not currently binding, these challenges may impair goods distribution and push up costs in the future.

On the demand side, momentum remains a risk, especially among consumers. We've repeatedly expected spending to slow, only to be wrong. Ongoing economic momentum that outstrips available supply remains a risk to the inflation outlook.

But slower progress on inflation is not the only risk we face. On the other side of our mandate, the labor market could falter.

Let me be clear. We do not see that right now. So far, labor market conditions have eased without a rise in unemployment. In technical terms, we've been sliding down the steep portion of the Beveridge curve, where changes in labor demand reduce vacancies without reducing jobs and pushing up unemployment (see Figura and Waller 2022 and Bok et al. 2022; Crust, Lansing, and Petrosky-Nadeau 2023 link analysis of the Beveridge curve to the Phillips curve tradeoff between unemployment and inflation, reinforcing the view that inflation can fall without a sharp increase in unemployment). As the vacancy rate gets closer to its pre-pandemic average, these favorable conditions could end, and the tradeoff between falling labor demand and unemployment could be more stark.

Of course, with employment growth as strong as it has been, this seems like a distant risk. But given the speed at which labor market pivots historically occur, it's a risk we must keep in mind.

Finishing the job

So that's the landscape. The economy is healthy. Price stability is within sight. But there is more work to do.

To finish the job will take fortitude. We will need to resist the temptation to act quickly when patience is needed and be prepared to respond agilely as the economy evolves.

This is not a new situation for the Fed or any central bank. Uncertainty is a fact of life. The economy rarely signals exactly where it is headed.

The constant in our changing environment is our goals. They are always sustainable price stability and full employment for a healthy economy. And these are more than just words, a fact I'm reminded of nearly every day.

After the dry cleaner last December, I went to the hardware store. I was standing in line behind a dad and his college-age daughter. When the total rang up, the dad asked the cashier why it was so high. Without hesitation, the cashier said, inflation—everything costs more.

As the two walked out of the store, the daughter said, "I never heard about inflation before the pandemic." Her dad responded, "I hope you never do again."

That is really what we are after. An economy unburdened by inflation, where people can step off the treadmill and make decisions about their lives and livelihoods without worrying about rapidly changing prices. We want price stability built to last.

Mary C. Daly
President and Chief Executive Officer, Federal Reserve Bank of San Francisco

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FRBSF ECONOMIC LETTER

2012-34 | November 13, 2012

The Federal Reserve's Unconventional Policies

BY JOHN C. WILLIAMS

After the federal funds rate target was lowered to near zero in 2008, the Federal Reserve has used two types of unconventional monetary policies to stimulate the U.S. economy: forward policy guidance and large-scale asset purchases. These tools have been effective in pushing down longer-term Treasury yields and boosting other asset prices, thereby lifting spending and the economy. The following is adapted from a presentation by the president and CEO of the Federal Reserve Bank of San Francisco at the University of California, Irvine, on November 5, 2012.

The subject of my talk is the unconventional monetary policies pursued by the Federal Reserve over the past four years. In my time today, I'll cover three big questions. First, why has the Fed turned to unconventional monetary policies? Second, what effects are these policies having on the economy? And, third, what potential risks do they pose?

The limits of conventional monetary policy

Let me start with the first question, why unconventional monetary policy? Back in late 2008, our country was facing the worst financial crisis and recession since the Great Depression. Real gross domestic product, the broadest measure of how much we produce as a nation, plummeted at an annual rate of 8.9% in the fourth quarter of 2008. The economy was in free fall and the unemployment rate was soaring. In response, in December 2008, the Fed's monetary policy body, the Federal Open Market Committee, or FOMC, cut the target federal funds rate—our conventional instrument of monetary policy—essentially to zero.

The federal funds rate is the short-term interest rate that is normally the FOMC's primary lever used to influence the economy and inflation. When we want to stimulate the economy, we lower the target fed funds rate. This causes other interest rates—like rates on car loans and mortgages—to decline. And it boosts the value of the stock market as investors equalize risk-adjusted returns across their portfolios. In response to lower borrowing costs and the resulting improvement in financial conditions, households and businesses are more willing to spend, creating greater demand for goods and services. This increase in demand in turn causes businesses to increase production and hire more workers. When we want to slow the economy so it doesn't overheat and create inflationary pressures, we raise the fed funds rate and everything works in the opposite direction. That's conventional monetary policy in a nutshell.

Given the economy's dire straits during the recession, standard rules of thumb for monetary policy suggested that the funds rate should be cut to well below zero (see Rudebusch 2009 and Chung et al. 2012). But that was impossible. Why can't interest rates be pushed well below zero? Well, one simple reason is that currency—the cash in your wallet—pays no interest. Think about it. If bank accounts paid

negative interest—that is, if people were charged to keep their money in a bank—then depositors could take money out of their accounts and keep it as hard cash. That would save them the interest expense. Economists refer to this floor on interest rates as the zero lower bound.

Meanwhile, the economic outlook was grim. So, given the inability to cut interest rates well below zero, we began to explore alternative ways to ease credit conditions and thereby stimulate the economy. We also had an eye on inflation, which was heading lower, thereby creating a situation in which deflation might be a threat. I will focus specifically on two types of unconventional monetary policies that the Fed and other central banks put in place around that time. The first is what we at the Fed call forward policy guidance. The second is what we call large-scale asset purchases, but which are popularly known as quantitative easing, or QE.

Forward policy guidance

The first type of unconventional monetary policy that I will discuss is forward policy guidance. Let me start with some background. After each monetary policy meeting, the FOMC releases a statement describing the state of the economy and the reasons for our policy decision about our target for the federal funds rate (see Williams 2012b for a description of monetary policy statement evolution over the past two decades). In addition, the statement often contains language discussing economic risks and where the FOMC thinks monetary policy may be headed (see Rudebusch and Williams 2008). It's interesting to note that the statement language typically has bigger effects on financial conditions than the federal funds rate decision itself (see Gürkaynak, Sack, and Swanson 2005). That's not that surprising. After all, the current level of the federal funds rate only tells what the overnight interest rate is right now. But the FOMC's statement language hints at where those short-term rates are likely to be in the future. That's much more relevant information for households, businesses, and investors. They are typically borrowing for expenditures such as cars, homes, or business capital spending, which are generally financed over a longer term.

Although the FOMC has used versions of forward guidance at various times in the past, the use of the policy statement to provide more explicit information about future policy took a quantum leap forward in the summer of 2011. With the fed funds rate stuck near zero, forward guidance provided a tool to influence longer-term interest rates and financial market conditions. Forward guidance achieves its effects by influencing market expectations for the future path of interest rates. Let me give a concrete example. Around the middle of 2011, private-sector economists expected that the FOMC would start raising the fed funds rate in about nine months to a year, according to surveys of professional forecasters and financial market indicators (see Swanson and Williams 2012).

The introduction of forward guidance in the August 2011 FOMC statement succeeded in shifting market expectations regarding the future path of the federal funds rate. Specifically, the FOMC stated that it "anticipates that economic conditions...are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013." That statement communicated that the FOMC would probably keep the fed funds rate near zero for at least two more years, longer than many private-sector economists had been thinking. As a result of this shift in expectations, yields on Treasury securities fell by between one- and two-tenths of a percentage point. This may not sound like a big change. But in terms of the effects of monetary policy, those were actually big drops. In fact, this was about as big a fall in interest rates as would normally come from cutting the federal funds rate by three-quarters or even a full percentage

point (see Gürkaynak, Sack, and Swanson 2005 and Chung et al. 2012). And, the ripple effect through financial markets lowered the cost of credit for all kinds of borrowers, not just the U.S. Treasury.

The use of forward policy guidance has now become a key monetary policy tool. Since August 2011, the FOMC has extended forward guidance twice. In January 2012, the FOMC said it would keep the fed funds rate exceptionally low "at least through late 2014." Just this September, it extended its guidance further, "at least through mid-2015." The FOMC also said it would maintain low rates "for a considerable time after the economic recovery strengthens." In other words, it indicated it intends to keep short-term rates low even as the economy improves to make sure this recovery takes hold. I should note that the Fed is not alone in using forward guidance. Other central banks provide forward policy guidance in a variety of ways.

Although forward policy guidance has proven to be a very useful policy tool, it's not a perfect substitute for the kind of monetary stimulus that comes from lower interest rates. One issue is that, for the forward guidance policy to work as desired, the public has to believe that the FOMC will really carry out the policy as it says it will. But, the Fed doesn't have the ability to tie its hands that way. This point was made by Finn Kydland and Edward Prescott in the late 1970s. Let me explain. For forward policy guidance to have its maximum effect, the Fed must commit to keeping the short-term policy rate lower than it otherwise would to compensate for the fact that the short-term interest rate cannot be lowered today. But when the time comes to carry out the commitment made in its forward guidance, it may no longer want to do so. For instance, it might be hard to resist raising rates earlier than promised to head off an increase in inflation (see Adam and Billi 2007). So, even when central bankers say they will keep rates unusually low for a set time, the public may worry that the central bank will raise rates earlier to fight budding inflation pressures (Evans 2010 is an exception; see Walsh 2009 for discussion).

Another challenge for forward guidance is that the public may have different expectations about the future of the economy and monetary policy than the central bank. Expectations are crucial for forward guidance to be effective. If the public doesn't understand the central bank's intended policy path, then forward guidance may not work so well (see Reifschneider and Roberts 2006 and Williams 2006). Therefore, clear communication of policy to the public is a key challenge. This isn't always easy. The public and the media tend to gloss over the nuances of policy and take away simple sound bites.

Large-scale asset purchases

Let me now turn to the second form of unconventional monetary policy, large-scale asset purchases. The goal of large-scale asset purchases, or LSAPs, is the same as for conventional policy actions and forward guidance: to drive down longer-term interest rates, and thereby boost economic growth. How do LSAPs work? First, let me tell you when they wouldn't work. In a hypothetical world of perfect financial markets, LSAPs would have essentially no effect on asset prices or the economy. In such a world, the price of an asset depends solely on its expected future returns, adjusted for risk. If the price of a specific asset deviated from this level, arbitrageurs would swoop in to take advantage of the discrepancy, knowing that the price would inevitably return to its proper level. Suppose the Fed were to step in and buy large amounts of an asset class, say, for example, Treasury securities. In that case, other investors would freely sell their holdings and rebalance their portfolios accordingly. But, asset prices would not change at all. And there would be no impact on the broader economy.

The reason LSAPs work is that financial markets are not perfect. Decades ago, James Tobin and Franco Modigliani pointed out that markets are to a certain degree segmented. Some investors, such as pension funds, have "preferred habitats" for their investments. For example, a pension fund might prefer longer-term securities to hedge its longer-term liabilities. Thus, the supply and demand of assets in these habitats can affect prices because that pension fund is not going to start buying short-term securities just because the prices of longer-term securities rise.

Now, if the Fed buys significant quantities of longer-term Treasury securities or mortgage-backed securities, then the supply of those securities available to the public falls. As supply falls, the prices of those securities rise and their yields decline. The effects extend to other longer-term securities. Mortgage rates and corporate bond yields fall as investors who sold securities to the Fed invest that money elsewhere. Hence, LSAPs drive down a broad range of longer-term borrowing rates. And lower rates get households and businesses to spend more than they otherwise would, boosting economic activity.

LSAPs can also affect interest rates by signaling that the central bank is determined to ease monetary conditions (see Bauer and Rudebusch 2012, Christensen and Rudebusch 2012, and Krishnamurthy and Vissing-Jorgensen 2011). Effectively, the central bank is putting its money where its mouth is. Thus, LSAPs reinforce forward guidance. For this reason, I view these two types of unconventional monetary policy as complementary.

The use of LSAPs goes back to a 1961 initiative with the catchy name of Operation Twist, an effort by the Fed and the Kennedy Administration to drive down longer-term interest rates. More recently, in late 2008 and 2009, the Fed purchased over $1.7 trillion of longer-term Treasury bonds and mortgage-backed securities, a program often referred to as QE1. In November 2010, the FOMC announced an additional $600 billion of longer-term bond purchases—QE2. And, two months ago, we got QE3 when the FOMC announced that the Fed would buy an additional $40 billion in mortgage-backed securities every month until the outlook for the job market improves substantially.

Other central banks have also carried out large-scale asset purchase programs. The Bank of Japan began a large-scale asset purchase program in 2001. In its most recent program, launched in 2010, it has bought roughly $1.1 trillion in Japanese government bonds and other assets. In March 2009, the Bank of England announced an LSAP program that was later raised to the equivalent of roughly $600 billion in purchases mostly of British government bonds. Both of these central banks have continued and expanded their asset purchase programs in the past year.

The effects of unconventional monetary policy on the economy

A great deal of research has analyzed the effects of forward policy guidance and large-scale asset purchases on financial conditions and the economy. As I mentioned before, forward policy guidance has proven to be effective at lowering expectations of future interest rates (see Swanson and Williams 2012 and Woodford 2012). Similarly, the evidence shows that LSAPs have been effective at improving financial conditions as well.

To be precise, the estimated impact of a $600 billion LSAP program, such as QE2, is to lower the 10-year Treasury yield by between 0.15 and 0.20 percentage point (see, for example, Williams 2011, Krishnamurthy and Vissing-Jorgensen 2011, Hamilton and Wu 2012, Swanson 2011, Gagnon et al. 2011,

and Chen, Curdia, and Ferrero 2012). It is around the same magnitude as the effects of forward policy guidance, and about how much the yield on 10-year Treasury securities typically responds to a cut in the fed funds rate of three-quarters to one percentage point (see Chung et al. 2012 and Gürkaynak, Sack, and Swanson 2005). So, by that metric, LSAPs have big effects on longer-term Treasury yields.

By pushing down longer-term Treasury yields, forward guidance and LSAPs have rippled through to other interest rates and boosted other asset prices, lifting spending and the economy. For example, mortgage rates have fallen below 3½%, apparently the lowest level since at least the 1930s. Thanks in part to those rock-bottom rates, we're at long last seeing signs of life in the housing market. Likewise, cheap auto financing rates have spurred car sales. And historically low corporate bond rates encourage businesses to start new projects and hire more workers.

In addition, low interest rates help to support asset prices, such as the value of people's homes and their retirement funds. All else equal, households are more likely to consume if their wealth is growing rather than falling. Stronger asset prices support consumption because they make people feel wealthier and more confident. And that in turn helps boost the economy.

Finally, although it's not our main intention, these unconventional policies have also had an effect on the dollar versus foreign currencies. When interest rates in the United States fall relative to rates in other countries, the dollar tends to decline as money flows to foreign markets with higher returns. One estimate is that a $600 billion program like QE2 causes the dollar to fall by roughly 3 or 4% (see Neely 2011). That helps stimulate the U.S. economy by making American goods more competitive at home and abroad.

I've argued that forward guidance and LSAPs invigorate the economy by lowering interest rates and improving financial conditions more generally. But just how big are these effects? That's not easy to answer. Financial markets react instantly to FOMC announcements, so it's relatively easy to gauge the financial impact of any policy move. By contrast, monetary policy actions affect economic growth, employment, and inflation gradually over time. Thus, the broad economic effects of monetary policy are not immediately obvious. Moreover, data on unemployment and gross domestic product are only collected monthly or quarterly. Many factors besides monetary policy affect these variables. In any particular data release, it's devilishly hard to separate the contribution of monetary policy from other factors.

To control for these other factors, a researcher must use a macroeconomic model. In some of my own research with staff at the Federal Reserve Board, we used the Board's large-scale macroeconomic model, which has hundreds of economic relationships built in, for this purpose (see Chung et al. 2012). We estimated that the Fed's $600 billion QE2 program lowered the unemployment rate by about 0.3 percentage point compared with what it would have been without the program. We also estimated that the program raised GDP by a little over half a percentage point and inflation by 0.2 percentage point. When we considered the combined effects of QE1 and QE2, we found that these programs had a peak effect of reducing the unemployment rate by 1½ percentage points. In addition, we found that these programs probably prevented the U.S. economy from falling into deflation.

Other researchers using different macroeconomic models have found roughly similar effects, although there is a lot of uncertainty surrounding these estimates (see Chen, Curdia, and Ferrero 2012, Kiley 2012,

Fuhrer and Olivei 2011, Baumeister and Benati 2010, and Curdia and Ferrero 2011). Part of the uncertainty stems from the fact that changes in longer-term interest rates due to LSAPs may be atypical. That is, they may affect the economy differently than do changes in longer-term interest rates in normal times. That would make the past relationship between longer-term interest rates and the economy less informative for estimating the effects of unconventional monetary policy.

Risks and uncertainty

Although the evidence shows that the Fed's unconventional policy actions have been effective at lowering interest rates and stimulating economic growth, it's also clear that there remains a great deal of uncertainty about the effects of these policies. After decades of using the fed funds rate as the main tool of monetary policy, Fed policymakers have plenty of confidence in this instrument. We know it works and we're pretty good at estimating how much it works. By contrast, with unconventional monetary policies, we're in waters that have not been extensively charted. We don't know all the consequences. There is uncertainty about the magnitude of the effects on the economy, as I've already discussed. In addition, there is a concern that these policies carry with them risks of unintended negative consequences. Let me go over a few of those concerns.

One concern is that the Fed's very low rate policies may be building up inflationary pressures that we can't yet see (see Williams 2012a). Of course, this risk is not peculiar to unconventional policies. It exists whenever monetary policy is very expansionary. Although this is a risk, it's important to note in the current context that inflation has been very low during this period of unconventional policies, and it remains so. Moreover, the public's inflation expectations remain well anchored. So, we are not seeing signs of rising inflation on the horizon. Japan's experience with unconventional policies is informative as well. Japan has had undesirably low inflation since the 1990s despite the Bank of Japan's very large quantitative easing programs.

Nonetheless, whenever a stimulatory monetary policy is in place, there is always a risk of inflation rising too high. Let me emphasize that the Fed has the tools to combat such a threat if it were to materialize. We can raise interest rates, slowing economic growth. And we can reverse the asset purchase programs, selling assets back into the market if needed.

A second concern is that these policies may be contributing to excessive risk-taking in financial markets as investors seek higher yields in the low-rate environment. I take this concern seriously. We monitor indicators of financial market conditions very closely, looking for signs of imbalances or excesses. In addition, in our role as bank supervisors, we carefully watch for signs of inappropriate risk-taking. We are always on the lookout for indications that the low-rate environment is creating dangers for the banking system. That said, as of today, most indications still point to an environment of heightened risk aversion rather than reckless risk-taking in our financial system. Memories of 2008 are simply too close for most financial market participants to go out on a limb. If that situation were to change significantly, we could modify our unconventional policies to mitigate undesired effects on risk-taking.

I've highlighted the uncertain effects of unconventional policies and some concerns about undesired consequences of these policies. But, the presence of uncertainty does not mean that we shouldn't be using these tools. That is the point that William Brainard analyzed 45 years ago in his classic paper on optimal policy under uncertainty. The answer Brainard (1967) found was that a policy tool with

uncertain effects should not be discarded. However, it should be employed more cautiously than policy tools that have more certain effects. This insight applies to the current situation. The Fed has been deliberate in using its unconventional policies over the past few years. We've carefully weighed the benefits of these policies on improving economic growth against potential risks and uncertainties.

Conclusion

Let me offer some final thoughts. Unconventional monetary policies such as forward guidance and large-scale asset purchases give central banks effective instruments when the traditional policy interest rate is near zero. The Fed and other central banks have been actively using these policies. In the United States, these policies have had meaningful effects on longer-term interest rates and other financial conditions. The precise impact on unemployment, GDP, and inflation is harder to determine. But the available evidence suggests they have been effective in stimulating growth without creating an undesirable rise in inflation. Conducting monetary policy always involves striking the right balance between the benefits and risks of a policy action. As the FOMC statement makes clear: "In determining the size, pace, and composition of its asset purchases, the Committee will, as always, take appropriate account of the likely efficacy and costs of such purchases."

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New Economic Challenges and the Fed's Monetary Policy Review

Remarks by

Jerome H. Powell

Chair

Board of Governors of the Federal Reserve System

at

"Navigating the Decade Ahead: Implications for Monetary Policy," an economic policy symposium sponsored by the Federal Reserve Bank of Kansas City

Jackson Hole, Wyoming
(via webcast)

August 27, 2020

Thank you, Esther, for that introduction, and good morning. The Kansas City Fed's Economic Policy Symposiums have consistently served as a vital platform for discussing the most challenging economic issues of the day. Judging by the agenda and the papers, this year will be no exception.

For the past year and a half, my colleagues and I on the Federal Open Market Committee (FOMC) have been conducting the first-ever public review of our monetary policy framework.[1] Earlier today we released a revised Statement on Longer-Run Goals and Monetary Policy Strategy, a document that lays out our goals, articulates our framework for monetary policy, and serves as the foundation for our policy actions.[2] Today I will discuss our review, the changes in the economy that motivated us to undertake it, and our revised statement, which encapsulates the main conclusions of the review.

Evolution of the Fed's Monetary Policy Framework

We began this public review in early 2019 to assess the monetary policy strategy, tools, and communications that would best foster achievement of our congressionally assigned goals of maximum employment and price stability over the years ahead in service to the American people. Because the economy is always evolving, the FOMC's strategy for achieving its goals—our policy framework—must adapt to meet the new challenges that arise. Forty years ago, the biggest problem our economy faced was high and rising inflation.[3] The Great Inflation demanded a clear focus on restoring the

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[1] See Board of Governors (2018) and Clarida (2019).
[2] The revised Statement on Longer-Run Goals and Monetary Policy Strategy is available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200827a.htm.
[3] Consumer price inflation, which was running below 2 percent in the early 1960s, had risen into the double digits by the late 1970s and was slightly above 12 percent when the Committee gathered for an unscheduled meeting in the Eccles Building in Washington, D.C., on a Saturday in October 1979—before

credibility of the FOMC's commitment to price stability. Chair Paul Volcker brought that focus to bear, and the "Volcker disinflation," with the continuing stewardship of Alan Greenspan, led to the stabilization of inflation and inflation expectations in the 1990s at around 2 percent. The monetary policies of the Volcker era laid the foundation for the long period of economic stability known as the Great Moderation. This new era brought new challenges to the conduct of monetary policy. Before the Great Moderation, expansions typically ended in overheating and rising inflation. Since then, prior to the current pandemic-induced downturn, a series of historically long expansions had been more likely to end with episodes of financial instability, prompting essential efforts to substantially increase the strength and resilience of the financial system.[4]

By the early 2000s, many central banks around the world had adopted a monetary policy framework known as inflation targeting.[5] Although the precise features of inflation targeting differed from country to country, the core framework always articulated an inflation goal as a primary objective of monetary policy. Inflation targeting was also associated with increased communication and transparency designed to clarify the central bank's policy intentions. This emphasis on transparency reflected what was then a new appreciation that policy is most effective when it is clearly understood by the public. Inflation-targeting central banks generally do not focus solely on inflation: Those with "flexible" inflation targets take into account economic stabilization in addition to their inflation objective.

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the days when transparency was the hallmark of institutional accountability—and decided to change the conduct of monetary policy. See Volcker and Gyohten (1992); also see Volcker (2008), pp. 73–74.

[4] See Powell (2019).

[5] For a readable explanation of inflation targeting, see Bernanke and Mishkin (1997); also see Bernanke and others (1999).

Under Ben Bernanke's leadership, the Federal Reserve adopted many of the features associated with flexible inflation targeting.[6] We made great advances in transparency and communications, with the initiation of quarterly press conferences and the Summary of Economic Projections (SEP), which comprises the individual economic forecasts of FOMC participants. During that time, then–Board Vice Chair Janet Yellen led an effort on behalf of the FOMC to codify the Committee's approach to monetary policy. In January 2012, the Committee issued its first Statement on Longer-Run Goals and Monetary Policy Strategy, which we often refer to as the consensus statement. A central part of this statement was the articulation of a longer-run inflation goal of 2 percent.[7] Because the structure of the labor market is strongly influenced by nonmonetary factors that can change over time, the Committee did not set a numerical objective for maximum employment. However, the statement affirmed the Committee's commitment to fulfilling both of its congressionally mandated goals. The 2012 statement was a significant milestone, reflecting lessons learned from fighting high inflation as well as from experience around the world with flexible inflation targeting. The statement largely articulated the policy framework the Committee had been following for some time.[8]

Motivation for the Review

The completion of the original consensus statement in January 2012 occurred early on in the recovery from the Global Financial Crisis, when notions of what the "new normal" might bring were quite uncertain. Since then, our understanding of the economy

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[6] For the formalization and development of the concept of flexible inflation targeting, see Svensson (1999) and, more recently, Svensson (2020).
[7] As measured by the annual change in the price index for personal consumption expenditures.
[8] See Board of Governors (2012), p. 43.

has evolved in ways that are central to monetary policy. Of course, the conduct of monetary policy has also evolved. A key purpose of our review has been to take stock of the lessons learned over this period and identify any further changes in our monetary policy framework that could enhance our ability to achieve our maximum-employment and price-stability objectives in the years ahead.[9]

Our evolving understanding of four key economic developments motivated our review. First, assessments of the potential, or longer-run, growth rate of the economy have declined. For example, since January 2012, the median estimate of potential growth from FOMC participants has fallen from 2.5 percent to 1.8 percent (see figure 1). Some slowing in growth relative to earlier decades was to be expected, reflecting slowing population growth and the aging of the population. More troubling has been the decline in productivity growth, which is the primary driver of improving living standards over time.[10]

Second, the general level of interest rates has fallen both here in the United States and around the world. Estimates of the neutral federal funds rate, which is the rate consistent with the economy operating at full strength and with stable inflation, have fallen substantially, in large part reflecting a fall in the equilibrium real interest rate, or "r-star." This rate is not affected by monetary policy but instead is driven by fundamental factors in the economy, including demographics and productivity growth—the same factors that drive potential economic growth.[11] The median estimate from

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[9] On the benefits of holding a review, see Fuhrer and others (2018).

[10] Between 1995 and 2003, business-sector output per hour increased at an annual rate of 3.4 percent, and it has risen only 1.4 percent since then. Fernald (2015) suggests 2003 as a break point for the beginning of the productivity slowdown. See also Fernald (2018), Gordon (2017), and Powell (2018).

[11] Estimates of r-star have fallen between 2 and 3 percentage points over the past two decades. For evidence on the secular decline in interest rates in the United States and abroad see, for instance, Holston,

FOMC participants of the neutral federal funds rate has fallen by nearly half since early 2012, from 4.25 percent to 2.5 percent (see figure 2).

This decline in assessments of the neutral federal funds rate has profound implications for monetary policy. With interest rates generally running closer to their effective lower bound even in good times, the Fed has less scope to support the economy during an economic downturn by simply cutting the federal funds rate.[12] The result can be worse economic outcomes in terms of both employment and price stability, with the costs of such outcomes likely falling hardest on those least able to bear them.

Third, and on a happier note, the record-long expansion that ended earlier this year led to the best labor market we had seen in some time. The unemployment rate hovered near 50-year lows for roughly 2 years, well below most estimates of its sustainable level. And the unemployment rate captures only part of the story. Having declined significantly in the five years following the crisis, the labor force participation rate flattened out and began rising even though the aging of the population suggested that it should keep falling.[13] For individuals in their prime working years, the participation rate fully retraced its post-crisis decline, defying earlier assessments that the Global Financial Crisis might cause permanent structural damage to the labor market.

Laubach, and Williams (2017) and Lunsford and West (2019). See also the recent evidence in Lopez-Salido and others (2020).

[12] Both the experience following the Global Financial Crisis and the current situation drive this point home. After the Global Financial Crisis, the Fed held the federal funds rate at the lower bound for seven years. Thereafter, as the economy strengthened, the federal funds rate reached a peak just above 2 percent. By comparison, the federal funds rate averaged a little more than 5 percent in the 1990s. And, at the onset of the COVID pandemic, we quickly cut rates to the effective lower bound. But since the federal funds rate was only about 1-1/2 percent before the pandemic—because that is what the economy required at that time—our scope to reduce the federal funds rate was far less than in earlier recessions.

[13] The labor force participation rate for prime-age individuals (those between 25 and 54 years old), which is much less sensitive to the effects of population aging, has been rising over the past few years and continued to increase in 2019. For a longer-run perspective, see the analysis presented in Aaronson and others (2014).

Moreover, as the long expansion continued, the gains began to be shared more widely across society. The Black and Hispanic unemployment rates reached record lows, and the differentials between these rates and the white unemployment rate narrowed to their lowest levels on record.[14] As we heard repeatedly in our *Fed Listens* events, the robust job market was delivering life-changing gains for many individuals, families, and communities, particularly at the lower end of the income spectrum.[15] In addition, many who had been left behind for too long were finding jobs, benefiting their families and communities, and increasing the productive capacity of our economy. Before the pandemic, there was every reason to expect that these gains would continue. It is hard to overstate the benefits of sustaining a strong labor market, a key national goal that will require a range of policies in addition to supportive monetary policy.

Fourth, the historically strong labor market did not trigger a significant rise in inflation. Over the years, forecasts from FOMC participants and private-sector analysts routinely showed a return to 2 percent inflation, but these forecasts were never realized on a sustained basis (see figure 3). Inflation forecasts are typically predicated on estimates of the natural rate of unemployment, or "u-star," and of how much upward pressure on inflation arises when the unemployment rate falls relative to u-star.[16] As the unemployment rate moved lower and inflation remained muted, estimates of u-star were revised down. For example, the median estimate from FOMC participants declined from

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[14] The decline in the unemployment rate for African Americans has been particularly sizable, and its average rate in the second half of October 2019 was the lowest recorded since the data began to be reported in 1972; see Board of Governors (2020a). See also Daly (2020) and Aaronson and others (2019).

[15] Information on the *Fed Listens* events is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications-fed-listens-events.htm.

[16] A discussion of various concepts of unemployment rate benchmarks that are frequently used by policymakers for assessing the current state of the economy is presented in Crump and others (2020).

5.5 percent in 2012 to 4.1 percent at present (see figure 4). The muted responsiveness of inflation to labor market tightness, which we refer to as the flattening of the Phillips curve, also contributed to low inflation outcomes.[17] In addition, longer-term inflation expectations, which we have long seen as an important driver of actual inflation, and global disinflationary pressures may have been holding down inflation more than was generally anticipated. Other advanced economies have also struggled to achieve their inflation goals in recent decades.

The persistent undershoot of inflation from our 2 percent longer-run objective is a cause for concern. Many find it counterintuitive that the Fed would want to push up inflation. After all, low and stable inflation is essential for a well-functioning economy. And we are certainly mindful that higher prices for essential items, such as food, gasoline, and shelter, add to the burdens faced by many families, especially those struggling with lost jobs and incomes. However, inflation that is persistently too low can pose serious risks to the economy. Inflation that runs below its desired level can lead to an unwelcome fall in longer-term inflation expectations, which, in turn, can pull actual inflation even lower, resulting in an adverse cycle of ever-lower inflation and inflation expectations.

This dynamic is a problem because expected inflation feeds directly into the general level of interest rates. Well-anchored inflation expectations are critical for giving the Fed the latitude to support employment when necessary without destabilizing inflation.[18] But if inflation expectations fall below our 2 percent objective, interest rates

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[17] See, for instance, Blanchard, Cerutti, and Summers (2015).
[18] The success of monetary policy in taming high and variable inflation in the 1980s and 1990s was instrumental in anchoring inflation expectations at low levels. See, for instance, Goodfriend (2007).

would decline in tandem. In turn, we would have less scope to cut interest rates to boost employment during an economic downturn, further diminishing our capacity to stabilize the economy through cutting interest rates. We have seen this adverse dynamic play out in other major economies around the world and have learned that once it sets in, it can be very difficult to overcome. We want to do what we can to prevent such a dynamic from happening here.

Elements of the Review

We began our review with these changes in the economy in mind. The review had three pillars: a series of *Fed Listens* events held around the country, a flagship research conference, and a series of Committee discussions supported by rigorous staff analysis. As is appropriate in our democratic society, we have sought extensive engagement with the public throughout the review.

The *Fed Listens* events built on a long-standing practice around the Federal Reserve System of engaging with community groups. The 15 events involved a wide range of participants—workforce development groups, union members, small business owners, residents of low- and moderate-income communities, retirees, and others—to hear about how our policies affect peoples' daily lives and livelihoods.[19] The stories we heard at *Fed Listens* events became a potent vehicle for us to connect with the people and communities that our policies are intended to benefit. One of the clear messages we heard was that the strong labor market that prevailed before the pandemic was generating

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[19] See the report *Fed Listens: Perspectives from the Public* (Board of Governors, 2020b), which summarizes the 14 *Fed Listens* events hosted by the Board and the Federal Reserve Banks during 2019, as well as an additional event in May 2020 to follow up with participants about the effects of the COVID-19 pandemic on their communities. Information on the individual *Fed Listens* events is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications-fed-listens-events.htm.

employment opportunities for many Americans who in the past had not found jobs readily available. A clear takeaway from these events was the importance of achieving and sustaining a strong job market, particularly for people from low- and moderate-income communities.

The research conference brought together some of the world's leading academic experts to address topics central to our review, and the presentations and robust discussion we engaged in were an important input to our review process.[20]

Finally, the Committee explored the range of issues that were brought to light during the course of the review in five consecutive meetings beginning in July 2019. Analytical staff work put together by teams across the Federal Reserve System provided essential background for each of the Committee's discussions.[21]

Our plans to conclude the review earlier this year were, like so many things, delayed by the arrival of the pandemic. When we resumed our discussions last month, we turned our attention to distilling the most important lessons of the review in a revised Statement on Longer-Run Goals and Monetary Policy Strategy.

New Statement on Longer-Run Goals and Monetary Policy Strategy

The federated structure of the Federal Reserve, reflected in the FOMC, ensures that we always have a diverse range of perspectives on monetary policy, and that is certainly the case today. Nonetheless, I am pleased to say that the revised consensus statement was adopted today with the unanimous support of Committee participants. Our

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[20] The Federal Reserve System's "Conference on Monetary Policy Strategy, Tools, and Communication Practices (A *Fed Listens* Event)" was hosted by the Federal Reserve Bank of Chicago in June 2019. See https://www.federalreserve.gov/conferences/conference-monetary-policy-strategy-tools-communications-20190605.htm for the conference program, links to the conference papers and presentations, and links to session videos. A special issue of the *International Journal of Central Banking* (February 2020) included five of the seven papers presented at the conference (see https://www.ijcb.org/journal/ijcb2002.htm).

[21] See the overview presented in Altig and others (2020).

new consensus statement, like its predecessor, explains how we interpret the mandate Congress has given us and describes the broad framework that we believe will best promote our maximum-employment and price-stability goals. Before addressing the key changes in our statement, let me highlight some areas of continuity. We continue to believe that specifying a numerical goal for employment is unwise, because the maximum level of employment is not directly measurable and changes over time for reasons unrelated to monetary policy. The significant shifts in estimates of the natural rate of unemployment over the past decade reinforce this point. In addition, we have not changed our view that a longer-run inflation rate of 2 percent is most consistent with our mandate to promote both maximum employment and price stability. Finally, we continue to believe that monetary policy must be forward looking, taking into account the expectations of households and businesses and the lags in monetary policy's effect on the economy. Thus, our policy actions continue to depend on the economic outlook as well as the risks to the outlook, including potential risks to the financial system that could impede the attainment of our goals.

The key innovations in our new consensus statement reflect the changes in the economy I described. Our new statement explicitly acknowledges the challenges posed by the proximity of interest rates to the effective lower bound. By reducing our scope to support the economy by cutting interest rates, the lower bound increases downward risks to employment and inflation.[22] To counter these risks, we are prepared to use our full range of tools to support the economy.

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[22] See Caldara and others (2020).

With regard to the employment side of our mandate, our revised statement emphasizes that maximum employment is a broad-based and inclusive goal. This change reflects our appreciation for the benefits of a strong labor market, particularly for many in low- and moderate-income communities.[23] In addition, our revised statement says that our policy decision will be informed by our "assessments of the *shortfalls* of employment from its maximum level" rather than by "*deviations* from its maximum level" as in our previous statement.[24] This change may appear subtle, but it reflects our view that a robust job market can be sustained without causing an outbreak of inflation.

In earlier decades when the Phillips curve was steeper, inflation tended to rise noticeably in response to a strengthening labor market. It was sometimes appropriate for the Fed to tighten monetary policy as employment rose toward its estimated maximum level in order to stave off an unwelcome rise in inflation. The change to "shortfalls" clarifies that, going forward, employment can run at or above real-time estimates of its maximum level without causing concern, unless accompanied by signs of unwanted increases in inflation or the emergence of other risks that could impede the attainment of our goals.[25] Of course, when employment is below its maximum level, as is clearly the

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[23] The analysis of how alternative strategies that succeed in reducing the frequency and/or severity of ELB recessions can induce longer run beneficial effects on economic inequality is presented in Feiveson and others (2020).

[24] Italics added for emphasis. The 2012 statement noted that the Committee would mitigate "deviations" of employment from the Committee's assessments of its maximum level, suggesting that the Committee would actively seek to lower employment if it assessed that employment was above the Committee's estimate of its maximum level. In practice, the Committee has not conducted policy in this way, but rather has supported continued gains in the labor market.

[25] In addition, because real-time estimates are highly uncertain, we no longer refer to estimates of the natural rate of unemployment from the SEP in our consensus statement. Another reason for dropping this reference is that the unemployment rate does not adequately capture the full range of experience in the labor market. The SEP will continue to report FOMC participants' estimates of the longer-run level of the unemployment rate, as such information remains a useful, albeit highly incomplete, input into our policy deliberations.

case now, we will actively seek to minimize that shortfall by using our tools to support economic growth and job creation.

We have also made important changes with regard to the price-stability side of our mandate. Our longer-run goal continues to be an inflation rate of 2 percent. Our statement emphasizes that our actions to achieve both sides of our dual mandate will be most effective if longer-term inflation expectations remain well anchored at 2 percent. However, if inflation runs below 2 percent following economic downturns but never moves above 2 percent even when the economy is strong, then, over time, inflation will average less than 2 percent. Households and businesses will come to expect this result, meaning that inflation expectations would tend to move below our inflation goal and pull realized inflation down. To prevent this outcome and the adverse dynamics that could ensue, our new statement indicates that we will seek to achieve inflation that averages 2 percent over time. Therefore, following periods when inflation has been running below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time.

In seeking to achieve inflation that averages 2 percent over time, we are not tying ourselves to a particular mathematical formula that defines the average. Thus, our approach could be viewed as a flexible form of average inflation targeting.[26] Our decisions about appropriate monetary policy will continue to reflect a broad array of considerations and will not be dictated by any formula. Of course, if excessive

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[26] This strategy embodies some key lessons from the general class of makeup strategies that have been analyzed extensively in the economics literature. The literature has emphasized that the proximity of interest rates to the effective lower bound poses an asymmetric challenge for monetary policy, increasing the likelihood that inflation and employment will tend to be too low. An extensive discussion about how these issues affect the design of monetary policy, as well as the relevant related literature, can be found in Duarte and others (2020), Arias and others (2020), and Hebden and others (2020).

inflationary pressures were to build or inflation expectations were to ratchet above levels consistent with our goal, we would not hesitate to act.

The revisions to our statement add up to a robust updating of our monetary policy framework. To an extent, these revisions reflect the way we have been conducting policy in recent years. At the same time, however, there are some important new features. Overall, our new Statement on Longer-Run Goals and Monetary Policy Strategy conveys our continued strong commitment to achieving our goals, given the difficult challenges presented by the proximity of interest rates to the effective lower bound. In conducting monetary policy, we will remain highly focused on fostering as strong a labor market as possible for the benefit of all Americans. And we will steadfastly seek to achieve a 2 percent inflation rate over time.

Looking Ahead

Our review has provided a platform for productive discussion and engagement with the public we serve. The *Fed Listens* events helped us connect with our core constituency, the American people, and hear directly how their everyday lives are affected by our policies. We believe that conducting a review at regular intervals is a good institutional practice, providing valuable feedback and enhancing transparency and accountability. And with the ever-changing economy, future reviews will allow us to take a step back, reflect on what we have learned, and adapt our practices as we strive to achieve our dual-mandate goals. As our statement indicates, we plan to undertake a thorough public review of our monetary policy strategy, tools, and communication practices roughly every five years.

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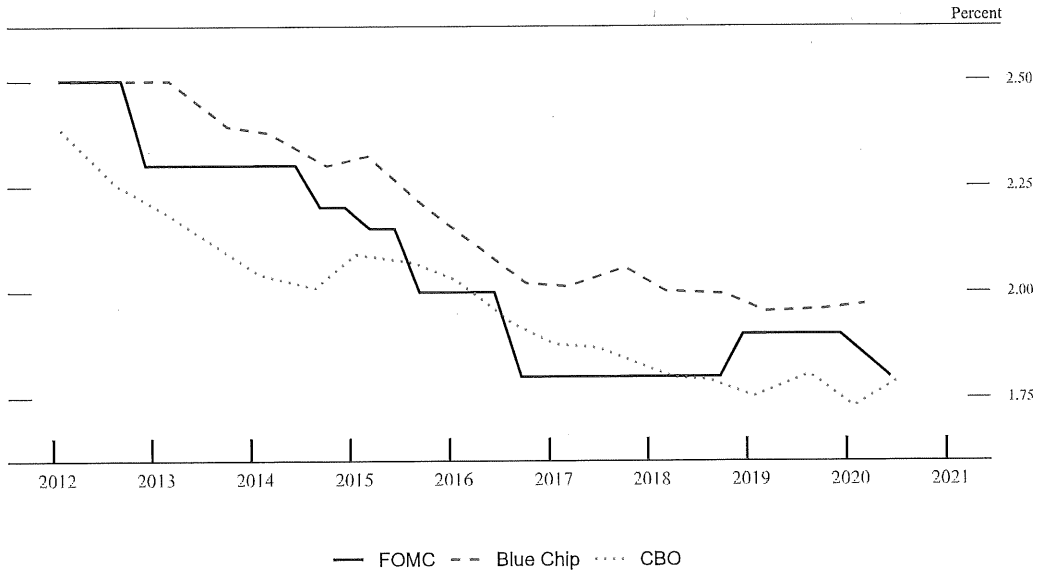
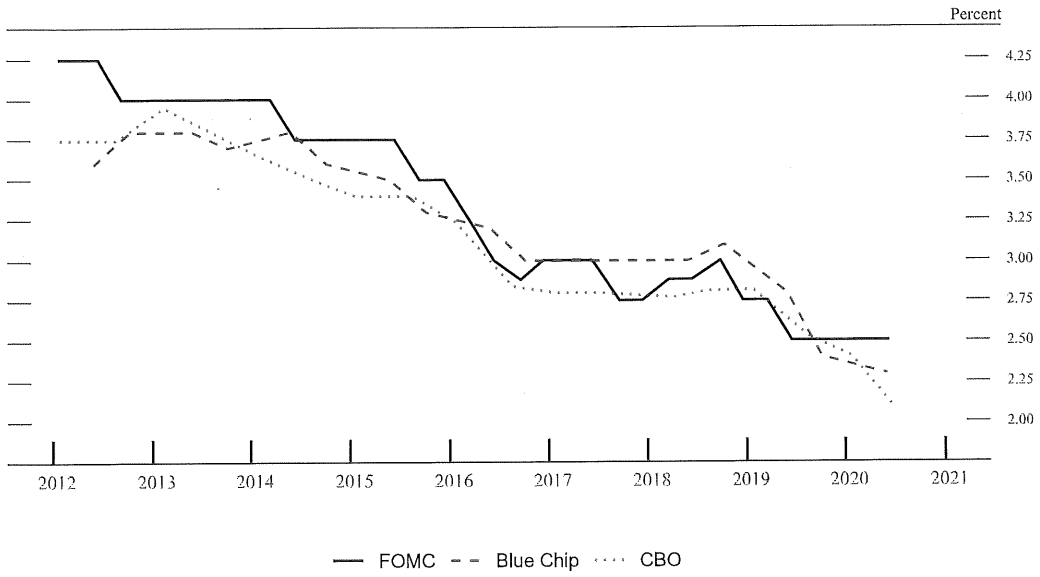
Figure 1: Real-Time Projections of Longer-Run Real Gross Domestic Product Growth



Note: The Federal Open Market Committee (FOMC) data are quarterly, extend through June 2020, and are median projections of longer-term normal; for 2015:Q1 and 2015:Q2, the data are central tendency midpoints. The Blue Chip data are biannual, extend through March 2020, and are consensus projections for 6 to 10 years in the future. The Congressional Budget Office (CBO) data are biannual, extend through July 2020, and are baseline projections for the calendar year 10 years ahead.

Source: For FOMC, Summary of Economic Projections, available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm; for Blue Chip, Wolters Kluwer, Blue Chip Economic Indicators; for CBO, Congressional Budget Office (The Budget and Economic Outlook, 10-Year Economic Projections).

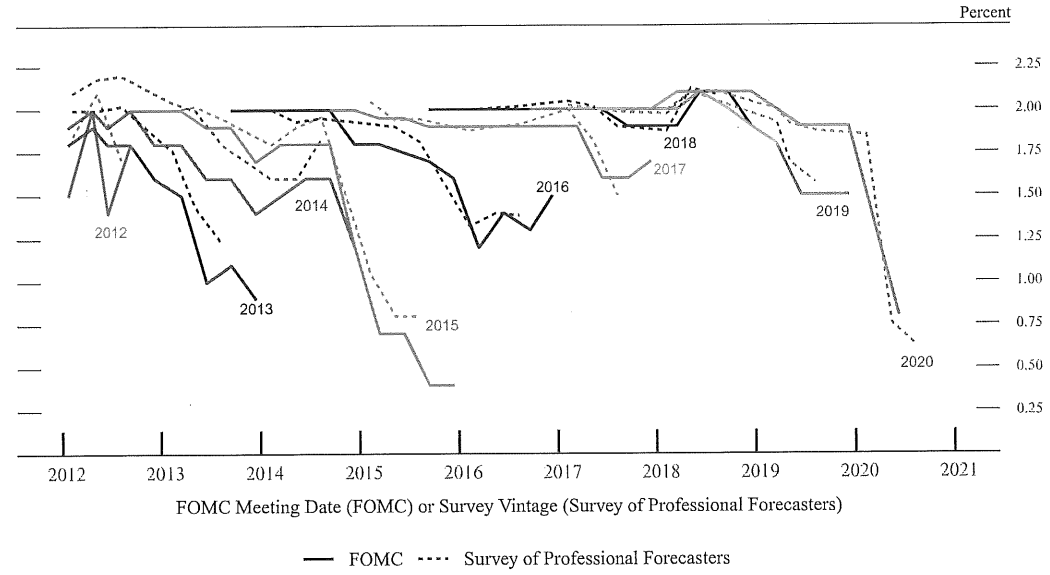
Figure 2: Real-Time Projections of Longer-Run Federal Funds Rate



Note: The Federal Open Market Committee (FOMC) data are quarterly, extend through June 2020, and are median projections of longer-term normal (rounded to the nearest 1/8 percentage point). The Blue Chip data are biannual, extend through June 2020, and are consensus estimates for 6 to 10 years in the future. The Congressional Budget Office (CBO) data are biannual, extend through July 2020, and are baseline projections of the three-month Treasury bill rate for the calendar year 10 years ahead.

Source: For FOMC, Summary of Economic Projections, available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm; for Blue Chip, Wolters Kluwer, Blue Chip Financial Forecasts; for CBO, Congressional Budget Office (The Budget and Economic Outlook, 10-Year Economic Projections).

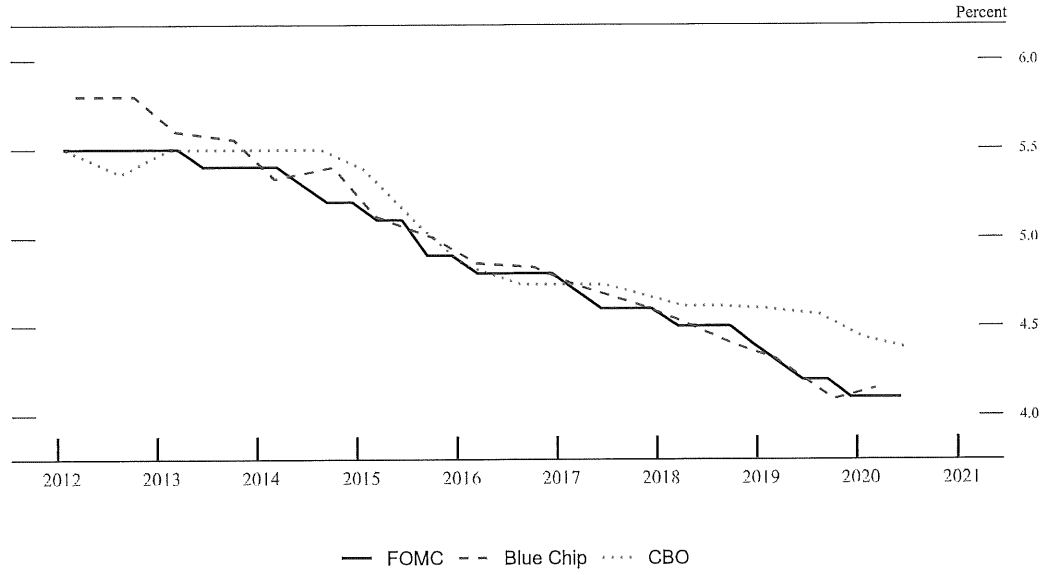
Figure 3: Evolution of Real-Time Projections for Personal Consumption Expenditures Inflation



Note: The Federal Open Market Committee (FOMC) data, represented by the solid lines, are median projections published quarterly; the latest data vintage is June 2020. For 2015:Q1 and 2015:Q2, the data are central tendency midpoints. The Survey of Professional Forecasters (SPF) data, represented by the dashed lines, are median projections published quarterly; the latest data vintage corresponds to 2020:Q3.

Source: For FOMC, Summary of Economic Projections, available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm; for SPF, Federal Reserve Bank of Philadelphia.

Figure 4: Real-Time Projections of Longer-Run Unemployment Rate



Note: The Federal Open Market Committee (FOMC) data are quarterly, extend through June 2020, and are median projections of longer-term normal; for 2015:Q1 and 2015:Q2, the data are central tendency midpoints. The Blue Chip data are biannual, extend through March 2020, and are consensus projections for 6 to 10 years in the future. The Congressional Budget Office (CBO) data are biannual, extend through July 2020, and correspond to the baseline estimate of the underlying long-term rate of unemployment for the current quarter at the time of the projection.

Source: For FOMC, Summary of Economic Projections, available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm; for Blue Chip, Wolters Kluwer, Blue Chip Economic Indicators; for CBO, Congressional Budget Office (The Budget and Economic Outlook, 10-Year Economic Projections).

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The Federal Reserve's New Framework: Context and Consequences

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The Federal Reserve's New Framework: Context and Consequences

Richard H. Clarida

January 2022

Introduction

This paper discusses the Federal Reserve's new framework and highlights some important policy implications that flow from the revised consensus statement and the new strategy. In particular, it first discusses the factors that motivated the Federal Reserve in November 2018 to announce it would undertake in 2019 the first-ever public review of its monetary policy strategy, tools, and communication practices. It then considers the major findings of the review as codified in our new Statement on Longer-Run Goals and Monetary Policy Strategy and highlights some important policy implications that flow from them.[1]

Motivation for the Review

As the Federal Open Market Committee (FOMC) indicated from the outset, the fact that the Federal Reserve System chose to conduct this review did not indicate that we believed we had been poorly served by the framework in place since 2012. Indeed, I would argue that over the 2012–20 period, the framework served us well and supported the Federal Reserve's efforts after the Global Financial Crisis (GFC) first to achieve and then, for several years, to sustain—until cut short in the spring of 2020 by the COVID-19

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[1] This paper was written for a special issue of the *Revue d'Économie Financière*, "New Doctrines of Central Banking," edited by Benoît Cœuré and Hans-Helmut Kotz. It builds on Clarida (2020a, 2020b, 2021a, 2021b, and 2021c). The views expressed in this paper are my own and not necessarily those of other Federal Reserve Board members or Federal Open Market Committee participants. I am grateful to Burcu Duygan-Bump and Chiara Scotti for help in preparing this paper; to Kate Lassiter, Ethan Lewis, Nicholas von Turkovich, and Laura Wilcox for excellent research assistance; and to Christopher Karlsten for outstanding editing help. All errors are my own responsibility. Send correspondence to Federal Reserve Board, Washington, DC 20551.

pandemic—the operation of the economy at or close to both our statutorily assigned goals of maximum employment and price stability in what became the longest economic expansion in U.S. history. Nonetheless, both the U.S. economy and, equally importantly, our understanding of the economy have clearly evolved along several crucial dimensions since 2012, and we believed that in 2019 it made sense to step back and assess whether, and in what possible ways, we might refine and rethink our strategy, tools, and communication practices to achieve and sustain our goals as consistently and robustly as possible in the global economy in which we operate today and for the foreseeable future.[2]

Perhaps the most significant change since 2012 in our understanding of the economy has been the substantial decline in estimates of the neutral real interest rate, r*, that, over the longer run, is consistent with our maximum-employment and price-stability mandates. Whereas in January 2012 the median FOMC participant projected a long-run r* of 2.25 percent and a neutral nominal policy rate of 4.25 percent, as of December 2021, the median FOMC participant projected a long-run r* equal to just 0.5 percent, which implies a neutral setting for the federal funds rate of 2.5 percent.[3] Moreover, as is well appreciated, the decline in neutral policy rates since the GFC is a global

[2] For a discussion of the elements that motivated the launch of the review and of how the previous policy framework had served us, see Clarida (2020a). See also Powell (2020).

[3] The most recent Summary of Economic Projections, released following the conclusion of the September 2021 FOMC meeting, is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm. See Chair Powell's address in Jackson Hole, Wyoming (Powell, 2020), for an illustration of the revisions to the macroeconomic projections—including for the longer-run neutral federal funds rate—of FOMC participants as well as private and public forecasters. The downward revisions to r* over time have been informed, in part, by the general fall in interest rates and by econometric evidence that suggests that this fall is of a permanent rather than a cyclical nature. See, among many contributors, Hamilton and others (2016), Laubach and Williams (2016), Del Negro and others (2017), Johannsen and Mertens (2018), and López-Salido and others (2020). For discussions of the various factors that might have contributed to this fall, see Fischer (2016) and Rachel and Smith (2017).

phenomenon that is widely expected by forecasters and financial markets to persist for years to come.[4]

The substantial decline in the neutral policy rate since 2012 has critical implications for monetary policy because it leaves the FOMC with less conventional policy space to offset adverse shocks to aggregate demand. This development, in turn, makes it more likely that recessions will impart elevated risks of more persistent downward pressure on inflation and upward pressure on unemployment that the Federal Reserve's monetary policy should, in design and implementation, seek to offset throughout the business cycle and not just in downturns themselves.[5]

Two other, related developments that have also become more evident than they appeared in 2012 are that price inflation seems less responsive to resource slack, and also, that estimates of resource slack based on historically estimated price Phillips curve relationships are less reliable and subject to more material revision than was once commonly believed.[6] For example, in the face of declining unemployment rates that did

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[4] For evidence on the global nature of the decline in r*, see King and Low (2014); Holston, Laubach, and Williams (2017); Wynne and Zhang (2018); and Del Negro and others (2019). For a discussion of global considerations for U.S. monetary policy, see Obstfeld (2020).

[5] For pre-GFC discussions of the macroeconomic consequences of policy rates being constrained by the effective lower bound (ELB), see Krugman (1998), Eggertsson and Woodford (2003), and Adam and Billi (2007). For the GFC and its aftermath, using a time-series approach, Eberly, Stock, and Wright (2020) estimate that, in the absence of the ELB constraint, the labor market recovery would have proceeded at a significantly more rapid pace than was observed, whereas core inflation would have been only modestly higher because of inflation's limited sensitivity to resource slack. Using a DSGE (dynamic stochastic general equilibrium) approach, the mean estimates of Gust and others (2017) suggest that a binding ELB accounted for about 30 percent (roughly 2 percentage points) of the 6 percent contraction in gross domestic product in 2009 relative to the peak in 2007 and was responsible for an even larger fraction of the ensuing slow recovery.

[6] For evidence of a flattening of the slope of the Phillips curve in the United States and abroad, see, among others, Simon, Matheson, and Sandri (2013); Blanchard, Cerutti, and Summers (2015); and Pfajfar and Roberts (2018). The difficulties in assessing shortfalls from maximum employment using measures of the unemployment rate have motivated researchers to explore alternative approaches. See Abraham, Haltiwanger, and Rendell (2020) for an approach based on the job search and matching framework. See also the staff discussion of various concepts of unemployment rate benchmarks by Crump, Nekarda, and Petrosky-Nadeau (2020), which was prepared as background materials for the framework review.

not result in excessive cost-push pressure to price inflation, the median of the Committee's projections of u*—the rate of unemployment consistent in the longer run with the 2 percent inflation objective—has been repeatedly revised lower, from 5.5 percent in January 2012 to 4 percent as of the December 2021 Summary of Economic Projections (SEP).[7] Projections of u* by the Congressional Budget Office and professional forecasters show a similar decline during this same period and for the same reason.[8] In the past several years of the previous expansion, declines in the unemployment rate occurred in tandem with a notable and welcome increase in real wages that was accompanied by an increase in labor's share of national income, but not a surge in price inflation to a pace inconsistent with our price-stability mandate and well-anchored inflation expectations. Indeed, this pattern of mid-cycle declines in unemployment coincident with noninflationary increases in real wages has been evident in the U.S. data since the 1990s.[9]

With regard to inflation expectations, there is broad agreement among academics and policymakers that achieving price stability on a sustainable basis requires that inflation expectations be well anchored at the rate of inflation consistent with the price-stability goal. The pre-GFC academic literature derived the important result that a credible inflation-targeting monetary policy strategy that is not constrained by the

[7] The large degree of uncertainty attached to estimates of r*, u*, the slope of the (short-run) Phillips curve, and other key economic objects adds additional risk-management considerations in the conduct of monetary policy, especially in a low r* environment in which the federal funds rate is likely to be constrained by the effective lower bound. See Powell (2019) for a discussion of the implications for monetary policy and Clarida (2020a). See also the model-based analyses of Erceg and others (2018), Ajello and others (2020), and Hebden and others (2020).
[8] See Powell (2020) for an illustration. See also Caldara and others (2020) for a discussion of how repeated surprises in macroeconomic forecasts affect inference about the appropriate stance of policy.
[9] See Clarida (2016, 2019), Heise, Karahan, and Şahin (2020), and Feroli, Silver, and Edgerton (2021) for discussions.

effective lower bound (ELB) can deliver, under rational expectations, inflation expectations that themselves are well anchored at the inflation target.[10] In other words, absent a binding ELB constraint, a policy that targets actual inflation in these models delivers long-run inflation expectations well anchored at the target "for free." But this "copacetic coincidence" no longer holds in a world of low r* in which adverse aggregate demand shocks are expected to drive the economy in at least some downturns to the ELB. In this case, economic analysis indicates that flexible inflation-targeting monetary policy cannot be relied on to deliver inflation expectations that are anchored at the target, but instead will tend to deliver inflation expectations that, in each business cycle, become anchored at a level below the target.[11] This downward bias in inflation expectations under inflation targeting in an ELB world can in turn reduce already scarce policy space—because nominal interest rates reflect both real rates and expected inflation—and it can open up the risk of the downward spiral in both actual and expected inflation that has been observed in some other major economies.

Inflation expectations are, of course, not directly observed and must be imperfectly inferred from surveys, financial market data, and econometric models. Each of these sources contains noise as well as signal, and they can and sometimes do give contradictory readings. But, at minimum, the failure of actual PCE (personal consumption expenditures) inflation—core or headline—over the 2012–20 period to reach the 2 percent goal on a sustained basis cannot have contributed favorably to

[10] See Bernanke and others (1999) for a review of the considerations that led to the adoption of inflation-targeting frameworks and the early international experience. See Svensson (1997), Clarida, Galí, and Gertler (1999), and Woodford (2003) for conceptual treatments of inflation targeting, including of rational expectations.

[11] See Mertens and Williams (2019) and Bianchi, Melosi, and Rottner (2019).

keeping inflation expectations anchored at 2 percent. Indeed, my reading of the evidence during this period is that the various measures of inflation expectations I follow resided at the low end of a range I consider consistent with our 2 percent inflation goal.

The New Statement and Strategy

On August 27, 2020, the FOMC unanimously approved a revised Statement on Longer-Run Goals and Monetary Policy Strategy that represents a robust evolution of its monetary policy framework.[12]

There are six key elements behind our new framework and the forward guidance provided since the September 2020 FOMC statement. Five of these elements define how the Committee will seek to achieve its price-stability mandate over time, while the sixth pertains to the Committee's conception of its maximum-employment mandate. Of course, the Committee's price-stability and maximum-employment mandates are generally complementary, and, indeed, this complementarity is recognized and respected in the forward-guidance language introduced in the September 2020 FOMC statement.[13] However, for ease of exposition, I will begin by focusing on the five elements of the new framework that define how the Committee will seek to achieve over time its price-stability mandate:

1. The Committee expects to delay liftoff from the ELB until PCE inflation has risen to 2 percent on an annual basis and other complementary conditions,

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[12] The Statement on Longer-Run Goals and Monetary Policy Strategy is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/review-of-monetary-policy-strategy-tools-and-communications-statement-on-longer-run-goals-monetary-policy-strategy.htm.

[13] The September 2020 FOMC statement says: "The Committee decided to keep the target range for the federal funds rate at 0 to ¼ percent and expects it will be appropriate to maintain this target range until labor market conditions have reached levels consistent with the Committee's assessments of maximum employment and inflation has risen to 2 percent and is on track to moderately exceed 2 percent for some time" (paragraph 4). The statement is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

consistent with achieving this goal on a sustained basis and to be discussed later, are met.[14]

2. With inflation having run persistently below 2 percent, the Committee will aim to achieve inflation moderately above 2 percent for some time in the service of having inflation average 2 percent over time and keeping longer-term inflation expectations well anchored at the 2 percent longer-run goal.[15]
3. The Committee expects that appropriate monetary policy will remain accommodative for some time after the conditions to commence policy normalization have been met.[16]
4. Policy will aim over time to return inflation to its longer-run goal, which remains 2 percent, but not below, once the conditions to commence policy normalization have been met.[17]
5. Inflation that averages 2 percent over time represents an ex ante aspiration of the FOMC, but not a time-inconsistent ex post commitment.[18]

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[14] The Statement on Longer-Run Goals and Monetary Policy Strategy articulates the inflation objective: "The Committee reaffirms its judgment that inflation at the rate of 2 percent, as measured by the annual change in the price index for personal consumption expenditures, is most consistent over the longer run with the Federal Reserve's statutory mandate" (paragraph 4). The September 2020 FOMC statement indicates the conditions for liftoff (see note 13).

[15] The September 2020 FOMC statement reads: "With inflation running persistently below this longer-run goal, the Committee will aim to achieve inflation moderately above 2 percent for some time so that inflation averages 2 percent over time and longer-term inflation expectations remain well anchored at 2 percent" (paragraph 4). A similar sentence appears in the Statement on Longer-Run Goals and Monetary Policy Strategy.

[16] The September 2020 FOMC statement reads: "The Committee seeks to achieve maximum employment and inflation at the rate of 2 percent over the longer run. With inflation running persistently below this longer-run goal, the Committee will aim to achieve inflation moderately above 2 percent for some time so that inflation averages 2 percent over time and longer-term inflation expectations remain well anchored at 2 percent. The Committee expects to maintain an accommodative stance of monetary policy until these outcomes are achieved" (paragraph 4).

[17] The Statement on Longer-Run Goals and Monetary Policy Strategy articulates the inflation objective (see note 14).

[18] The Statement on Longer-Run Goals and Monetary Policy Strategy says: "In order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages 2 percent

As I highlighted in Clarida (2020b, 2021a), I believe that a useful way to summarize the framework defined by these five features is *temporary price-level targeting (TPLT, at the ELB) that reverts to flexible inflation targeting (once the conditions for liftoff have been reached)*. Just such a framework has been analyzed by Bernanke, Kiley, and Roberts (2019) and Bernanke (2020), who in turn build on earlier work by Evans (2012), Reifschneider and Williams (2000), and Eggertsson and Woodford (2003), among many others.

A policy that delays liftoff from the ELB until a threshold for average inflation has been reached is one element of a TPLT strategy. Starting with our September 2020 FOMC statement, we communicated that inflation reaching 2 percent is a necessary condition for liftoff from the ELB.[19] The FOMC also indicated in these statements that the Committee expects to delay liftoff until inflation is "on track to moderately exceed 2 percent for some time." What "moderately" and "for some time" mean will depend on the initial conditions at liftoff (just as they do under other versions of TPLT), and the Committee's judgment on the projected duration and magnitude of the deviation from the 2 percent inflation goal will be communicated in the quarterly SEP for inflation.

Our new framework is asymmetric. That is, as in the TPLT studies cited earlier, the goal of monetary policy after lifting off from the ELB is to return inflation to its 2 percent longer-run goal, but not to push inflation below 2 percent, and the desired pace of return to 2 percent can reflect considerations other than the 2 percent longer-run goal

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over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time" (paragraph 4).

[19] This condition refers to inflation on an annual basis. TPLT with such a one-year memory has been studied by Bernanke, Kiley, and Roberts (2019).

for inflation that are relevant to the Committee's mandate. In the case of the Federal Reserve, we have highlighted that making sure that inflation expectations remain anchored at our 2 percent objective is just such a consideration. I follow closely the Fed staff's index of common inflation expectations (CIE)—which is now updated quarterly on the Board's website—as a relevant indicator that this goal is being met.[20] Other things being equal, my desired pace of policy normalization post liftoff to return inflation to 2 percent would be somewhat slower than otherwise if the CIE index at the time of liftoff is below the pre-ELB level.

Our framework aims ex ante for inflation to average 2 percent over time but does not make a commitment to achieve ex post inflation outcomes that average 2 percent under any and all circumstances. The same is true for the TPLT studies I cited earlier. In these studies, the only way in which average inflation enters the policy rule is through the timing of liftoff itself. Yet in stochastic simulations of the FRB/US model under TPLT with a one-year memory that reverts to flexible inflation targeting after liftoff, inflation does average very close to 2 percent in the stochastic simulations reported in Bernanke, Kiley, and Roberts (2019). The model of Mertens and Williams (2019) delivers a similar outcome: Even though the policy reaction function in their model does not incorporate an ex post makeup element, it delivers a long-run (unconditional) average rate of inflation equal to target by aiming for a moderate inflation overshoot away from the ELB that is calibrated to offset the inflation shortfall caused by the ELB.

[20] See Ahn and Fulton (2020) for a discussion of the CIE index and Ahn and Fulton (2021) for a link to the regular update.

The New Framework and Maximum Employment

An important evolution in our new framework is that the Committee now defines maximum employment as the highest level of employment that does not generate sustained pressures that put the price-stability mandate at risk.[21] As a practical matter, this definition means that, when the unemployment rate is elevated relative to my SEP projection of its long-run level, monetary policy should, as before, continue to be calibrated to eliminate such employment shortfalls as long as doing so does not put the price-stability mandate at risk. Indeed, since our September 2020 FOMC statement, we have indicated that we expect it will be appropriate to keep the federal funds rate in the current 0 to 25 basis point target range until inflation has reached 2 percent (on an annual basis) *and* labor market conditions have reached levels consistent with the Committee's assessment of maximum employment. In our new framework, when, in a business cycle expansion, labor market indicators return to a range that, in the Committee's judgment, is broadly consistent with its maximum-employment mandate, it will be data on inflation itself that policy will react to, but going forward, policy will not tighten solely because the unemployment rate has fallen below any particular econometric estimate of its long-run natural level.

This guidance has an important implication for the Taylor-type policy reaction function I will consult. In particular, I will continue—as I have done since joining the

[21] The Statement on Longer-Run Goals and Monetary Policy Strategy articulates this concept with the following: "The maximum level of employment is a broad-based and inclusive goal that is not directly measurable and changes over time owing largely to nonmonetary factors that affect the structure and dynamics of the labor market. Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee's policy decisions must be informed by assessments of the shortfalls of employment from its maximum level, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments" (paragraph 3).

Fed—to consult policy rules that respect the Taylor principle as a benchmark for calibrating the pace and destination of policy rate normalization once, after the inflation and employment thresholds have been reached, the process of policy normalization commences. Consistent with our new framework, the relevant policy rule benchmark I will consult after the conditions for liftoff have been met is an inertial Taylor-type rule with a coefficient of zero on the unemployment gap, a coefficient of 1.5 on the gap between core PCE inflation and the 2 percent longer-run goal, and a neutral real policy rate equal to my SEP projection of long-run r*. As discussed earlier, the degree of inertia in the benchmark rule I consult will depend on initial conditions at the time of liftoff, especially the reading of the staff's CIE index relative to its February 2020 level. Such a reference rule, which becomes relevant once the conditions for policy normalization have been met, is similar to the forward-looking Taylor-type rule for optimal monetary policy derived in Clarida, Galí, and Gertler (1999). The stability properties of Taylor-type rules in dynamic stochastic general equilibrium models have been studied by Bullard and Mitra (2002) and Galí (2008), among others, and they show that for the standard Taylor coefficient of 1.5 on the inflation gap and a coefficient of zero on the unemployment gap, the rational expectations equilibrium is unique for standard parametrizations.

Implications for Monetary Policy in the Current Macro Environment

As of December 2021, indicators of economic activity and employment reveal that the U.S. economy has continued to strengthen following the catastrophic collapse in economic activity in the first half of 2020 as a result of the global pandemic and the mitigation efforts put in place to contain it. Real gross domestic product (GDP) rose at a strong 6.5 percent pace in the first half of 2021, and growth is widely expected to

continue at a robust, though somewhat slower, pace in the second half of the year. If so, GDP growth in the 2021 calendar year could be the fastest since 1983, despite a surge in COVID-19 cases in the summer and supply chain bottlenecks that held back economic activity in the third quarter.

Core PCE inflation since February 2020—a calculation window that smooths out any base effects resulting from "round trip" declines and rebounds in the price levels of COVID-19-sensitive sectors and, coincidentally, also measures the average rate of core PCE inflation since hitting the ELB in March 2020—was running at a 3 percent annual pace through October 2021, and that reading is well above what I would consider to be a moderate overshoot of our 2 percent longer-run goal for inflation. Fully reopening the $20 trillion economy is essentially taking longer and has cost more than it did to shut it down. In particular, the reopening has been characterized by significant sectoral shifts in both aggregate demand and supply, and these shifts have been causing widespread bottlenecks and triggering substantial changes in the relative price and wage structure of the economy. A similar reopening dynamic has been playing out in other advanced economies, such as Canada and the United Kingdom. As these relative price adjustments work their way through the economy, measured inflation rises. But I continue to believe that the underlying rate of inflation in the U.S. economy is hovering close to our 2 percent longer-run objective and, thus, that the unwelcome surge in inflation in 2021, once these relative price adjustments are complete and bottlenecks have unclogged, will in the end prove to be largely transitory under appropriate monetary policy. Looking ahead, I note that, as shown in the most recent SEP, released in December 2021, inflation is projected to remain above 2 percent in all years of the projection window. As such, the

SEP median inflation projections for 2022 and 2023 are pointing to an inflation forecast that looks to be "on track to moderately exceed 2 percent for some time," the threshold specified in the FOMC statement.

As with overall economic activity, conditions in the labor market have also continued to improve. Job gains as measured by the payroll survey have continued to be robust over the past few months. Labor market progress this year, as measured by the Kansas City Fed's Labor Market Conditions Indicators, has been notable, with this index of 24 labor market indicators closing its shortfall relative to its pre-pandemic level. Nonetheless, factors related to the pandemic, such as caregiving obligations and ongoing fears of the virus, continue to weigh on employment and participation. Thus, the course of the labor market and, indeed, that of the economy continue to depend on the course of the virus, though my expectation today is that the labor market by the end of 2022 will have reached my assessment of maximum employment if the unemployment rate has declined by then to the SEP median of modal projections of 3.5 percent.

Given this outlook and so long as inflation expectations remain well anchored at the 2 percent longer-run goal—which, based on the Fed staff's CIE index, I judge at present to be the case and which I project will remain true over the forecast horizon—commencing policy normalization in 2022 would, under these conditions, be entirely consistent with our new flexible average inflation targeting framework. I note that under the December 2021 SEP median of modal projections, annualized PCE inflation since the new framework was adopted in August 2020 is projected to average 3.6 percent through year-end 2022 and 3.2 percent through year-end 2023.

In the context of our new framework, while the ELB can be a constraint on monetary policy, the ELB is not a constraint on fiscal policy, and appropriate monetary policy under our new framework, to me, must—and certainly can—incorporate this reality. Indeed, under present circumstances, I judge that the support to aggregate demand from fiscal policy—including the roughly $2 trillion in accumulated excess savings accruing from (as yet) unspent transfer payments—in tandem with appropriate monetary policy, can fully offset the constraint, highlighted in our Statement on Longer-Run Goals and Monetary Policy Strategy, that the ELB imposes on the ability of an inflation-targeting monetary policy, acting on its own and in the absence of sufficient fiscal support, to restore, following a recession, maximum employment and price stability while keeping inflation expectations well anchored at the 2 percent longer-run goal.[22]

Concluding Remarks

The Federal Reserve's new flexible average inflation targeting framework is a combination of TPLT at the ELB with flexible inflation targeting, to which TPLT reverts once the conditions to commence policy normalization articulated in our September 2020 FOMC statement have been met. In this sense, our new framework indeed represents an *evolution, not a revolution.* Importantly, even as the economy we face now looks different than when we set out to do the framework review, we think the new framework is set to serve us well. While supply and demand imbalances related to the pandemic and the reopening of the economy are contributing to elevated levels of inflation at the moment, several of the factors that motivated the review still stand, including the

[22] For a theoretical analysis of the fiscal and monetary policy mix at the ELB, see Woodford and Xie (2020). For studies of the government expenditure multiplier at the ELB, see Woodford (2011); Christiano, Eichenbaum, and Rebelo (2011); and Eggertsson (2011).

substantial decline in estimates of the neutral real interest rate. The FOMC is committed to using all available tools, including threshold-based forward guidance as well as large-scale asset purchases, to achieve the price-stability and maximum-employment goals specified in our new consensus statement.

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The Federal Reserve's New Monetary Policy Framework: A Robust Evolution

Remarks by

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Vice Chair

Board of Governors of the Federal Reserve System

at the

Peterson Institute for International Economics

Washington, D.C.
(via webcast)

August 31, 2020

Last week, the Federal Reserve reached an important milestone in its ongoing review of its monetary policy strategy, tools, and communication practices with the unanimous approval and release of a new Statement on Longer-Run Goals and Monetary Policy Strategy.[1] In my remarks today, I will discuss our new framework and highlight some important policy implications that flow from the revised statement and our new strategy.[2] I believe that this new statement and strategy represent a critical and robust evolution of our framework that will best equip the Federal Reserve to achieve our dual-mandate objectives on a sustained basis in the world in which we conduct policy today and for the foreseeable future.

I will divide my remarks into four parts. First, I will discuss the factors that motivated the Federal Reserve in November 2018 to announce it would undertake in 2019 the first-ever public review of its monetary policy strategy, tools, and communication practices. Second, I will discuss the review process itself, with particular focus on the economic analysis and public input the Federal Open Market Committee (FOMC) drew on as it contemplated, over the past 18 months, potential changes to its policy framework. Third, I will briefly summarize the flexible inflation-targeting strategy that has been guiding U.S. monetary policy since 2012 in the context of some important changes in the economic landscape that have become evident since 2012.

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[1] The revised statement is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/files/FOMC_LongerRunGoals.pdf. Last week, Chair Powell made the review and the revised statement the focus of his speech at "Navigating the Decade Ahead: Implications for Monetary Policy," a symposium sponsored by the Federal Reserve Bank of Kansas City and held in Jackson Hole, Wyoming; see Powell (2020).

[2] The views expressed are my own and not necessarily those of other Federal Reserve Board members or Federal Open Market Committee participants. I would like to thank Etienne Gagnon, Ellen Meade, Jon Faust, and Trevor Reeve for their assistance in preparing these remarks, and Thomas Laubach for sharing with me throughout the review process his many keen insights on monetary policy strategy and communication.

Fourth, I will discuss the major findings of the review as codified in our new Statement on Longer-Run Goals and Monetary Policy Strategy and highlight some important policy implications that flow from them. Finally, I will offer some brief concluding remarks before joining in conversation with my good friend Adam Posen, which, as always, I very much look forward to.

Motivation for the Review

As my FOMC colleagues and I indicated from the outset, the fact that the Federal Reserve System chose to conduct this review does not indicate that we believed we have been poorly served by the framework in place since 2012. Indeed, I would argue that over the past eight years, the framework served us well and supported the Federal Reserve's efforts after the Global Financial Crisis (GFC) first to achieve and then, for several years, to sustain—until cut short this spring by the COVID-19 pandemic—the operation of the economy at or close to both our statutorily assigned goals of maximum employment and price stability in what became the longest economic expansion in U.S. history. Nonetheless, both the U.S. economy—and, equally importantly, our understanding of the economy—have clearly evolved along several crucial dimensions since 2012, and we believed that in 2019 it made sense to step back and assess whether, and in what possible ways, we might refine and rethink our strategy, tools, and communication practices to achieve and sustain our goals as consistently and robustly as possible in the global economy in which we operate today and for the foreseeable future.[3]

Perhaps the most significant change since 2012 in our understanding of the economy is our reassessment of the neutral real interest rate, r*, that, over the longer run,

[3] For a discussion of the elements that motivated the launch of the review and of how the previous policy framework had served us, see Clarida (2019b). See also Powell (2019a).

is consistent with our maximum-employment and price-stability mandates. In January 2012, the median FOMC participant projected a long-run r* of 2.25 percent, which, in tandem with the inflation goal of 2 percent, indicated a neutral setting for the federal funds rate of 4.25 percent. However, in the eight years since 2012, members of the Committee—as well as outside forecasters and financial market participants—have repeatedly marked down their estimates of longer-run r* and, thus, the neutral nominal policy rate.[4] Indeed, as of the most recent Summary of Economic Projections (SEP) released in June, the median FOMC participant currently projects a longer-run r* equal to just 0.5 percent, which implies a neutral setting for the federal funds rate of 2.5 percent. Moreover, as is well appreciated, the decline in neutral policy rates since the GFC is a global phenomenon that is widely expected by forecasters and financial markets to persist for years to come.[5]

The substantial decline in the neutral policy rate since 2012 has critical implications for the design, implementation, and communication of Federal Reserve monetary policy because it leaves the FOMC with less conventional policy space to cut rates to offset adverse shocks to aggregate demand. With a diminished reservoir of conventional policy space, it is much more likely than was appreciated in 2012 that, in

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[4] See Chair Powell's address in Jackson Hole, Wyoming, last week (Powell, 2020) for an illustration of the revisions to the macroeconomic projections—including for the longer-run neutral federal funds rate—of FOMC participants as well as private and public forecasters. The downward revisions to r* over time have been informed, in part, by the general fall in interest rates and by econometric evidence that suggests that this fall is of a permanent rather than a cyclical nature. See, among many contributors, Hamilton and others (2016), Johannsen and Mertens (2018), Laubach and Williams (2016), Del Negro and others (2017), and López-Salido and others (2020). For discussions of the various factors that might have contributed to this fall, see Fischer (2016) and Rachel and Smith (2017).

[5] For evidence on the global nature of the decline in r*, see King and Low (2014); Holston, Laubach, and Williams (2017); Wynne and Zhang (2018); and Del Negro and others (2019). For a discussion of global considerations for U.S. monetary policy, see Obstfeld (2020).

economic downturns, the effective lower bound (ELB) will constrain the ability of the FOMC to rely solely on the federal funds rate instrument to offset adverse shocks.[6] This development, in turn, makes it more likely that recessions will impart elevated risks of more persistent downward pressure on inflation and upward pressure on unemployment that the Federal Reserve's monetary policy should, in design and implementation, seek to offset throughout the business cycle and not just in downturns themselves.[7]

Two other, related developments that have also become more evident than they appeared in 2012 are that price inflation seems less responsive to resource slack, and also, that estimates of resource slack based on historically estimated price Phillips curve relationships are less reliable and subject to more material revision than was once commonly believed.[8] For example, in the face of declining unemployment rates that did not result in excessive cost-push pressure to price inflation, the median of the Committee's projections of u*—the rate of unemployment consistent in the longer run with the 2 percent inflation objective—has been repeatedly revised lower, from

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[6] For assessments of the risk that the federal funds rate will be constrained by the ELB in the future, along with policy strategies that might mitigate that risk, see Kiley and Roberts (2017); Chung and others (2019); Hebden and López-Salido (2018); and Bernanke, Kiley, and Roberts (2019).

[7] For pre-GFC discussions of the macroeconomic consequences of policy rates being constrained by the ELB, see Krugman (1998), Eggertsson and Woodford (2003), and Adam and Billi (2007). For the GFC and its aftermath, using a time-series approach, Eberly, Stock, and Wright (2020) estimate that, in the absence of the ELB constraint, the labor market recovery would have proceeded at a significantly more rapid pace than was observed, whereas core inflation would have been only modestly higher because of inflation's limited sensitivity to resource slack. Using a DSGE (dynamic stochastic general equilibrium) approach, the mean estimates of Gust and others (2017) suggest that a binding ELB accounted for about 30 percent (roughly 2 percentage points) of the 6 percent contraction in gross domestic product in 2009 relative to the peak in 2007 and was responsible for an even larger fraction of the ensuing slow recovery.

[8] For evidence of a flattening of the slope of the Phillips curve in the United States and abroad, see, among others, Simon, Matheson, and Sandri (2013); Blanchard, Cerutti, and Summers (2015); and Pfajfar and Roberts (2018). The difficulties in assessing shortfalls from maximum employment using measures of the unemployment rate has motivated researchers to explore alternative approaches. See Abraham, Haltiwanger, and Rendell (2020) for an approach based on the job search and matching framework. See also the staff discussion of various concepts of unemployment rate benchmarks by Crump, Nekarda, and Petrosky-Nadeau (2020), which was prepared as background materials for this review.

5.5 percent in January 2012 to 4.1 percent as of the June 2020 SEP.[9] Projections of u* by the Congressional Budget Office and professional forecasters show a similar decline during this same period and for the same reason.[10] In the past several years of the previous expansion, declines in the unemployment rate occurred in tandem with a notable and, to me, welcome increase in real wages that was accompanied by an increase in labor's share of national income, but not a surge in price inflation to a pace inconsistent with our price-stability mandate and well-anchored inflation expectations. Indeed, this pattern of mid-cycle declines in unemployment coincident with noninflationary increases in real wages has been evident in the U.S. data since the 1990s.[11]

With regard to inflation expectations, there is broad agreement among academics and policymakers that achieving price stability on a sustainable basis requires that inflation expectations be well anchored at the rate of inflation consistent with the price-stability goal. This is especially true in the world that prevails today, with flat Phillips curves in which the primary determinant of actual inflation is expected inflation.[12] The

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[9] The large degree of uncertainty attached to estimates of r*, u*, the slope of the (short-run) Phillips curve, and other key economic objects adds additional risk-management considerations in the conduct of monetary policy, especially in a low r* environment in which the federal funds rate is likely to be constrained by the ELB. See Powell (2019b) for a discussion of the implications for monetary policy and my recent remarks in Clarida (2020). See also the model-based analyses of Erceg and others (2018), Ajello and others (2020), and Hebden and others (2020).

[10] See Powell (2020) for an illustration. See also Caldara and others (2020) for a discussion of how repeated surprises in macroeconomic forecasts affect inference about the appropriate stance of policy.

[11] See Clarida (2016, 2019c) and Heise, Karahan, and Şahin (2020) for discussions.

[12] See Yellen (2015) for a discussion of inflation dynamics and monetary policy and Erceg and others (2018) for a quantitative exploration of the monetary policy implications of a flat Phillips curve in an uncertain economic environment. Since the mid-1980s, movements in both realized inflation and measures of longer-term inflation expectations have been somewhat muted, complicating the task of extracting the precise role of inflation expectations as a determinant of realized inflation. Faust and Wright (2013) review the literature on inflation forecasting and present evidence in support of the conclusion that measures of longer-run inflation expectations help predict inflation. Mavroeidis, Plagborg-Møller, and Stock (2014) discuss the challenges of identifying the precise role of expectations in determining actual inflation. Cecchetti and others (2017) suggest that, in a low and stable inflation environment, policymakers should pay attention to a wide array of indicators in determining the implications for monetary policy of movements in realized inflation and measures of inflation expectations.

pre-GFC academic literature derived the important result that a credible inflation-targeting monetary policy strategy that is not constrained by the ELB can deliver, under rational expectations, inflation expectations that themselves are well anchored at the inflation target.[13] In other words, absent a binding ELB constraint, a policy that targets actual inflation in these models delivers long-run inflation expectations well anchored at the target "for free." But this "copacetic coincidence" no longer holds in a world of low r* in which adverse aggregate demand shocks are expected to drive the economy in at least some downturns to the ELB. In this case, which is obviously relevant today, economic analysis indicates that flexible inflation-targeting monetary policy cannot be relied on to deliver inflation expectations that are anchored at the target, but instead will tend to deliver inflation expectations that, in each business cycle, become anchored at a level below the target.[14] This is the crucial insight in my colleague John Williams' research with Thomas Mertens. Indeed John's research over the past 20 years on r* estimation and monetary policy design at the ELB have been enormously influential, not only in the profession but also at Fed and certainly in my own thinking about how our framework should evolve. This downward bias in inflation expectations under inflation targeting in an ELB world can in turn reduce already scarce policy space—because nominal interest rates reflect both real rates and expected inflation—and it can open up the risk of the downward spiral in both actual and expected inflation that has been observed in some other major economies.

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[13] See Bernanke and others (1999) for a review of the considerations that led to the adoption of inflation-targeting frameworks and the early international experience. See Svensson (1997), Clarida, Galí, and Gertler (1999), and Woodford (2003) for conceptual treatments of inflation targeting, including of rational expectations.

[14] See Mertens and Williams (2019) and Bianchi, Melosi, and Rottner (2019).

Inflation expectations are, of course, not directly observed and must be imperfectly inferred from surveys, financial market data, and econometric models. Each of these sources contains noise as well as signal, and they can and sometimes do give contradictory readings. But, at minimum, the failure of actual PCE (personal consumption expenditures) inflation—core or headline—over the past eight years to reach the 2 percent goal on a sustained basis cannot have contributed favorably to keeping inflation expectations anchored at 2 percent. Indeed, my reading of the evidence is that the various measures of inflation expectations I follow reside at the low end of a range I consider consistent with our 2 percent inflation goal.[15]

The Review Process

With this brief overview of important changes in the economic landscape since 2012, I would now like to discuss the review process itself. In November 2018, the Federal Reserve announced that in 2019 the System would undertake a wide-ranging, public review of its monetary policy strategy, tools, and communication practices. This initiative would be the first-ever *public* review of monetary policy strategy ever undertaken by the Fed. From the outset, it was conceived that the review would build on three pillars: a series of livestreamed *Fed Listens* events hosted by each of the 12 Reserve Banks and the Board, a flagship research conference hosted by the Federal Reserve Bank of Chicago, and a series of 13 rigorous briefings for the Committee by System staff at a succession of five consecutive FOMC meetings commencing in July 2019 and running through January 2020.

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[15] See Clarida (2020).

The *Fed Listens* series built on a long-standing practice at the Reserve Banks and the Board of hosting outreach events that included a wide range of community groups, but, by focusing on a common format in which representatives of these groups were encouraged to tell their stories about our policies' effect on their communities and daily lives, it became a potent vehicle for us to better connect with the people our policies are meant to benefit. Although many people across the System were involved in making *Fed Listens* the success it was, I would be more than remiss if I did not single out Ellen Meade for her indefatigable contributions and attention to detail and organization that were essential to pulling the whole thing off. A report on the *Fed Listens* series is available on the Board's web site.[16]

The second pillar of our review, a research conference hosted by the Federal Reserve Bank of Chicago, brought together some of the world's leading academic experts in monetary economics to present bespoke papers on a range of topics central to the review. These papers and the robust discussion at the conference that they stimulated were an important input to the review process. The proceedings of the Chicago conference are available as a special January 2020 issue of the *International Journal of Central Banking.*[17]

The third important pillar of the review is a collection of 13 memos prepared by System staff and discussed by the Committee at a number of FOMC meetings over the past 18 months. These memos were commissioned by a System steering committee that

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[16] See Board of Governors (2020).

[17] This special issue, which includes five of the seven papers presented at the research conference, is available on the journal's website at https://www.ijcb.org/journal/ijcb2002.htm. The conference program, conference drafts, presentations, and video recordings of the sessions can be found on the Board's website at https://www.federalreserve.gov/conferences/conference-monetary-policy-strategy-tools-communications-20190605.htm.

included Jeff Fuhrer, Marc Giannoni, and David Altig, with extensive input from Trevor Reeve. Thomas Laubach chaired the steering committee, and I must note that we simply would not be here today discussing this significant evolution of our framework without Thomas and the insights, inspiration, and good judgment that he brought to the project and the review process. A collection of the staff memos prepared for the review is now available on the Board's website.[18]

A New Economic Landscape Compels a Framework ReThink

As I mentioned earlier, the Committee devoted five consecutive FOMC meetings between July 2019 and January 2020 to presentations by the staff and Committee discussions of memos touching on various aspects of the framework review, and it held a lengthy discussion at the July 2020 FOMC meeting about the new Statement on Longer-Run Goals and Monetary Policy Strategy.[19] While it is fair to say that these Committee discussions revealed among the 17 participants a healthy range of views about and priorities for refining our framework and strategy, some common themes did emerge, and these provided the foundation for the revised Statement on Longer-Run Goals and Monetary Policy Strategy that the Committee discussed in July, approved last week, and released on Thursday, August 27.

Broadly, we agreed that the economic landscape has changed in important ways since 2012 and that, as a result, the existing statement and the monetary policy strategy

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[18] An overview of the System staff work in support of the review is presented in Altig and others (2020). Federal Reserve staff analysis on the *Fed Listens* initiative was presented and discussed at the December 2019 FOMC meeting and is part of the *Fed Listens* report.

[19] Summaries of these discussions can be found in the minutes of these FOMC meetings, which are accessible on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

that flows from it need as well to evolve along several dimensions.[20] For example, under our previous flexible inflation-targeting framework, the Federal Reserve declared that the 2 percent inflation objective is "symmetric." This term has been interpreted by many observers to mean that the Committee's reaction function aimed to be symmetric on either side of the 2 percent inflation goal, and that the FOMC set policy with the (ex ante) aim that the 2 percent goal should represent an inflation ceiling in economic expansions following economic downturns in which inflation falls below target. Regarding the ELB, the previous statement was silent on the global decline in neutral policy rates, the likelihood that the ELB will constrain monetary policy space in economic downturns, and the implications of this constraint for our ability to achieve our dual-mandate goals. As for inflation expectations, the previous statement did discuss expected inflation, but only in the context of mentioning that the announcement of a 2 percent goal helps anchor inflation expectations. While this is certainly true, it does beg the deeper question of how well anchored inflation expectations can be if the 2 percent goal is seen by the public as—and turns out ex post to be—a ceiling. Regarding the maximum-employment leg of the dual mandate, the previous statement's discussion of minimizing "deviations" of employment from its maximum level does not adequately reflect how the FOMC has actually conducted monetary policy in recent years—before the pandemic—as the actual unemployment rate was declining and, for several years, remained below SEP median

[20] The FOMC published the statement for the first time alongside its January 2012 postmeeting statement; the document is available on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20120125c.htm. This statement has been reaffirmed each year, and was updated in 2016 to include the language on symmetry. The version of the statement that prevailed at the start of the review, which was affirmed in January 2019, can be found on the Board's website at https://www.federalreserve.gov/newsevents/pressreleases/monetary20190130b.htm.

projections of u* (although, to be sure, the earlier statement did acknowledge that it can be difficult to estimate the maximum level of employment with precision).[21]

The New Statement and Strategy

Before discussing how our Statement on Longer-Run Goals and Monetary Policy Strategy has evolved, let me highlight some important elements that remain unchanged. First and foremost, our policy framework and strategy remain focused exclusively on meeting the dual mandate assigned to us by the Congress. Second, our statement continues to note that the maximum level of employment that we are mandated to achieve is not directly measurable and changes over time for reasons unrelated to monetary policy. Hence, we continue not to specify a numerical goal for our employment objective as we do for inflation. Third, we continue to state that an inflation rate of 2 percent over the longer run is most consistent with our mandate to promote both maximum employment and price stability. Finally, because the effect of monetary policy on the economy operates with a lag, our strategy remains forward looking. As a result, our policy actions depend on the economic outlook as well as the risks to the outlook, and we continue in the new statement to highlight potential risks to the financial system that could impede the attainment of our dual-mandate goals on a sustained basis.

With respect to the new framework itself, the statement now notes that the neutral level of the federal funds rate has declined relative to its historical average and therefore that the policy rate is more likely than in the past to be constrained by its ELB, and, moreover, that this binding ELB constraint is likely to impart downside risks to inflation and employment that the Committee needs to consider in implementing its monetary

[21] See my earlier remarks on these aspects in Clarida (2018a, 2018b, 2019a).

policy strategy. In this regard, the statement now highlights that the Committee is prepared to use its full range of tools to achieve its dual-mandate objectives.[22]

Regarding the maximum-employment mandate, the new statement now acknowledges that maximum employment is a "broad-based and inclusive goal" and continues to state that the FOMC considers a wide range of indicators to assess the level of maximum employment consistent with this broad-based goal. However, under our new framework, policy decisions going forward will be based on the FOMC's estimates of "*shortfalls* of employment from its maximum level"—not "deviations."[23] This change conveys our judgment that a low unemployment rate by itself, in the absence of evidence that price inflation is running or is likely to run persistently above mandate-consistent levels or pressing financial stability concerns, will not, under our new framework, be a sufficient trigger for policy action.[24] This is a robust evolution in the Federal Reserve's policy framework and, to me, reflects the reality that econometric models of maximum employment, while essential inputs to monetary policy, can be and have been wrong, and, moreover, that a decision to tighten monetary policy based solely on a model without any other evidence of excessive cost-push pressure that puts the price-stability mandate at risk is difficult to justify, given the significant cost to the economy if the model turns out to be

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[22] FOMC participants discussed the benefits, limitations, and risks associated with policy tools other than the setting of the federal funds rate target at various points during the review. See, notably, the summaries of FOMC participants' discussions at the July 2019 and October 2019 meetings—available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm—which covered, respectively, the performance of these tools during the GFC and its aftermath and issues pertaining to the use of these tools in the future. See also the analyses of Sims and Wu (2020), Caldara and others (2020), Campbell and others (2020), and Carlson and others (2020), prepared for this review.

[23] Italics added for emphasis.

[24] For a discussion of financial stability considerations in the conduct of monetary policy, see Kashyap and Siegert (2020) and Goldberg and others (2020), prepared as part of this review.

wrong and given the ability of monetary policy to respond if the model were eventually to turn out to be right.[25]

With regard to the price-stability mandate, while the new statement maintains our definition that the longer-run goal for inflation is 2 percent, it elevates the importance—and the challenge—of keeping inflation expectations "well anchored *at 2 percent*" (and not just "well anchored") in a world of low r* and an ELB constraint that is binding in downturns.[26] To this end, the new statement conveys the Committee's judgment that, in order to anchor expectations at 2 percent, it "seeks to achieve inflation that averages 2 percent over time," and—in the same sentence—that therefore "following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time." This is the second robust evolution of our framework, and it reflects the inherent asymmetry of conducting monetary policy in a low r* world with an ELB constraint that binds in economic downturns. As discussed earlier, if policy seeks only to return inflation to 2 percent following a downturn in which the ELB has constrained policy, an inflation-targeting monetary policy will tend to generate inflation that averages less than 2 percent, which, in turn, will tend to put persistent downward pressure on inflation expectations

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[25] As I stated in Clarida (2019a, paragraph 17), "For example, were models to predict a surge in inflation, a decision for preemptive hikes before the surge is evident in actual data would need to be balanced against the cost of the model being wrong." One major cost of withdrawing policy accommodation prematurely during an economic expansion is that it prevents job opportunities from reaching all communities. A clear takeaway from our *Fed Listens* events is that the strong job market that preceded the pandemic was especially beneficial to members of low- and moderate-income communities. The prolonged economic expansion not only helped create job opportunities for marginalized groups and cement their attachment to the labor force, but, as we heard at these events, it also more generally strengthened families, businesses, and communities. See Aaronson and others (2019) for a discussion of how a strong labor market helped address labor market disparities in the previous economic expansion. See also Feiveson and others (2020) for a discussion of distributional considerations and monetary policy.

[26] Italics added for emphasis.

and, potentially, on available policy space. In order to offset this downward bias, our new framework recognizes that monetary policy during economic expansions needs to "aim to achieve inflation moderately above 2 percent for some time." In other words, the aim to achieve *symmetric* outcomes for inflation (as would be the case under flexible inflation targeting in the absence of the ELB constraint) requires an *asymmetric* monetary policy reaction function in a low r* world with binding ELB constraints in economic downturns.

It is for this reason that while our new statement no longer refers to the 2 percent inflation goal as symmetric, it does now say that the Committee "seeks to achieve inflation that averages 2 percent over time." To be clear, "inflation that averages 2 percent over time" represents an ex ante aspiration, not a description of a mechanical reaction function—nor is it a commitment to conduct monetary policy tethered to any particular formula or rule.[27] Indeed, as summarized in the minutes of the September 2019 FOMC meeting, the Committee (and, certainly, I) was skeptical about the benefit, credibility, or practicality of adopting a formal numerical price level or average inflation target rule, just as it has been unwilling to implement its existing flexible inflation-targeting strategy via any sort of mechanical rule.[28] So in practice, what, then, is the

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[27] The absence of a commitment to a specific formula or rule should not be interpreted as the absence of a commitment to achieving our mandated goals. To the contrary, the revised statement has strengthened our commitment to achieving these goals in several important ways. Notably, it has clarified that we seek to achieve 2 percent inflation, on average, over time and that, when inflation has been running persistently too low, it is appropriate to aim for inflation outcomes moderately above 2 percent for some time to solidly anchor longer-run inflation expectations at 2 percent. The revised statement also emphasizes our resolve to use our full range of tools to achieve our goals. Clarity about our goals, strategy, and tools fosters greater democratic accountability in the pursuit of our dual mandate. For a discussion of time-consistency issues in monetary policy, see the staff analysis of Duarte and others (2020), prepared for this review.

[28] A summary of the September 2019 FOMC discussion is available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm. For the staff analysis presented as background to that discussion, see Arias and others (2020), Duarte and others (2020), and Hebden and others (2020). See also the related staff analysis by Chung and others (2020) on the use of operational inflation ranges.

policy implication of this stated desire "to achieve inflation that averages 2 percent over time"? Again, the implication of our new strategy for monetary policy is stated explicitly in the new statement, and, at the risk of repeating myself, let me restate it verbatim: "... following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time." Full stop. As Chair Powell indicated in his remarks last week, we think of this new strategy as an evolution from flexible inflation targeting to flexible average inflation targeting.[29]

Concluding Thoughts

My remarks today have been focused on our new framework and flexible average inflation targeting strategy. Of course, our review has also explored ways in which we might add to our toolkit and refine our communication practices. With regard to our toolkit, we believe that forward guidance and large-scale asset purchases have been and continue to be effective sources of support to the economy when the federal funds rate is at the ELB, and, of course, both were deployed promptly in our March 2020 policy response to the pandemic. With regard to other monetary policy tools, and as we have made clear previously in the minutes to our October 2019 FOMC meeting, we do not see negative policy rates as an attractive policy option in the U.S. context.[30] As for targeting the yield curve, our general view is that with credible forward guidance and asset purchases, the potential benefits from such an approach may be modest. At the same

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[29] Svensson (2020) argues that "forecast targeting" approaches, by which policymakers set the federal funds rate so as to best stabilize forecasts for inflation and employment around the FOMC's longer-run goals, outperform policy strategies that respond only to current economic conditions, past economic conditions, or both. In addition, he finds that average inflation targeting offers some advantages over the other strategies that he considers.

[30] The minutes of the FOMC's October 2019 meeting are available on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

time, the approach brings complications in terms of implementation and communications. Hence, as noted in the minutes from our previous meeting (July 2020), most of my colleagues judged that yield caps and targets were not warranted in the current environment but should remain an option that the Committee could reassess in the future if circumstances changed markedly.[31] Regarding communication practices, our new consensus statement does bring greater clarity and transparency to the way we will conduct policy going forward, and in that regard I note that Michelle Smith is leading our efforts to make immediately and readily available on the web a bounty of content that will be invaluable to those who desire a more granular understanding of the review process. Finally, now that we have ratified our new statement, the Committee can assess possible refinements to our SEP with the aim of reaching a decision on any potential changes by the end of this year.[32]

In closing, let me say that while I was not a member of the Committee in 2012, had I been I would have voted enthusiastically for the January 2012 statement. It was the right statement, and flexible inflation targeting was the right strategy, at that time and for the next eight years. The existing framework served us well by supporting the Federal Reserve's efforts after the GFC first to achieve and then, for several years, to sustain the operation of the economy at or close to both our statutorily assigned goals of maximum employment and price stability. But times change, as has the economic landscape, and

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[31] See the minutes of the FOMC's June 2020 and July 2020 meetings, which can be found on the Board's website at https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

[32] For a discussion of the importance of clear Federal Reserve communications in an uncertain economic environment, along with possible enhancements, see the paper Cecchetti and Schoenholtz (2019) prepared for the research conference at the Federal Reserve Bank of Chicago.

our framework and strategy need to change as well.[33] My colleagues and I believe that this new framework represents a critical and robust evolution of our monetary policy strategy that will best equip the Federal Reserve to achieve our dual-mandate objectives on a sustained basis in the world in which we conduct policy today and for the foreseeable future. Thank you very much for your time and attention, and I look forward now to my conversation with Adam.

[33] See Fuhrer and others (2018) for a discussion of the benefits of holding periodic reviews of central banks' monetary policy frameworks.

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Federal Reserve Board of Governors

Statement on Longer-Run Goals and Monetary Policy Strategy

Adopted effective January 24, 2012; as amended effective August 27, 2020

The Federal Open Market Committee (FOMC) is firmly committed to fulfilling its statutory mandate from the Congress of promoting maximum employment, stable prices, and moderate long-term interest rates. The Committee seeks to explain its monetary policy decisions to the public as clearly as possible. Such clarity facilitates well-informed decisionmaking by households and businesses, reduces economic and financial uncertainty, increases the effectiveness of monetary policy, and enhances transparency and accountability, which are essential in a democratic society.

Employment, inflation, and long-term interest rates fluctuate over time in response to economic and financial disturbances. Monetary policy plays an important role in stabilizing the economy in response to these disturbances. The Committee's primary means of adjusting the stance of monetary policy is through changes in the target range for the federal funds rate. The Committee judges that the level of the federal funds rate consistent with maximum employment and price stability over the longer run has declined relative to its historical average. Therefore, the federal funds rate is likely to be constrained by its effective lower bound more frequently than in the past. Owing in part to the proximity of interest rates to the effective lower bound, the Committee judges that downward risks to employment and inflation have increased. The Committee is prepared to use its full range of tools to achieve its maximum employment and price stability goals.

The maximum level of employment is a broad-based and inclusive goal that is not directly measurable and changes over time owing largely to nonmonetary factors that affect the structure and dynamics of the labor market. Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee's policy decisions must be informed by assessments of the shortfalls of employment from its maximum level, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments.

The inflation rate over the longer run is primarily determined by monetary policy, and hence the Committee has the ability to specify a longer-run goal for inflation. The Committee reaffirms its judgment that inflation at the rate of 2 percent, as measured by the annual change in the price index for personal consumption expenditures, is most consistent over the longer run with the Federal Reserve's statutory mandate. The Committee judges that longer-term inflation expectations that are well anchored at 2 percent foster price stability and moderate long-term interest rates and enhance the Committee's ability to promote maximum employment in the face of significant economic disturbances. In order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages 2 percent over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time.

Monetary policy actions tend to influence economic activity, employment, and prices with a lag. In setting monetary policy, the Committee seeks over time to mitigate shortfalls of employment from the Committee's assessment of its maximum level and deviations of inflation from its longer-run goal. Moreover, sustainably achieving maximum employment and price stability depends on a stable financial system. Therefore, the Committee's policy decisions reflect its longer-run goals, its medium-term outlook, and its assessments of the balance of risks, including risks to the financial system that could impede the attainment of the Committee's goals.

The Committee's employment and inflation objectives are generally complementary. However, under circumstances in which the Committee judges that the objectives are not complementary, it takes into account the employment shortfalls and inflation deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate.

The Committee intends to review these principles and to make adjustments as appropriate at its annual organizational meeting each January, and to undertake roughly every 5 years a thorough public review of its monetary policy strategy, tools, and communication practices.

In the revised Statement on Longer-Run Goals and Monetary Policy Strategy shown below, **underlined bold red** text shows additions and ~~struck-through~~ text shows deletions relative to the statement the Committee issued on January 29, 2019. Note that the discussion of the employment and inflation goals has been separated into two paragraphs and their order reversed relative to the January 2019 statement. To improve readability, these changes are not marked with underlined bold red text or struck-through text.

Statement on Longer-Run Goals and Monetary Policy Strategy

Adopted effective January 24, 2012; as amended effective ~~January 29, 2019~~ August 27, 2020

1. The Federal Open Market Committee (FOMC) is firmly committed to fulfilling its statutory mandate from the Congress of promoting maximum employment, stable prices, and moderate long-term interest rates. The Committee seeks to explain its monetary policy decisions to the public as clearly as possible. Such clarity facilitates well-informed decisionmaking by households and businesses, reduces economic and financial uncertainty, increases the effectiveness of monetary policy, and enhances transparency and accountability, which are essential in a democratic society.

2. Employment, inflation, ~~employment,~~ and long-term interest rates fluctuate over time in response to economic and financial disturbances. Monetary policy plays an important role in stabilizing the economy in response to these disturbances. The Committee's primary means of adjusting the stance of monetary policy is through changes in the target range for the federal funds rate. The Committee judges that the level of the federal funds rate consistent with maximum employment and price stability over the longer run has declined relative to its historical average. Therefore, the federal funds rate is likely to be constrained by its effective lower bound more frequently than in the past. Owing in part to the proximity of interest rates to the effective lower bound, the Committee judges that downward risks to employment and inflation have increased. The Committee is prepared to use its full range of tools to achieve its maximum employment and price stability goals. ~~Moreover, monetary policy actions tend to influence economic activity and prices with a lag. Therefore, the Committee's policy decisions reflect its longer-run goals, its medium-term outlook, and its assessments of the balance of risks, including risks to the financial system that could impede the attainment of the Committee's goals.~~

3. The maximum level of employment is a broad-based and inclusive goal that is not directly measurable and changes over time owing largely ~~determined by~~ to nonmonetary factors that affect the structure and dynamics of the labor market. ~~These factors may change over time and may not be directly measurable.~~ Consequently, it would not be appropriate to specify a fixed goal for employment; rather, the Committee's policy decisions must be informed by assessments of the shortfalls of employment from its maximum level ~~of employment~~, recognizing that such assessments are necessarily uncertain and subject to revision. The Committee considers a wide range of indicators in making these assessments. ~~Information about Committee participants' estimates of the longer-run normal rates of output growth and unemployment is published four times per year in the FOMC's Summary of Economic Projections. For example, in the most recent projections, the median of FOMC participants' estimates of the longer-run normal rate of unemployment was 4.4 percent.~~

4. The inflation rate over the longer run is primarily determined by monetary policy, and hence the Committee has the ability to specify a longer-run goal for inflation. The Committee reaffirms its judgment that inflation at the rate of 2 percent, as measured by the annual change in the price index for personal consumption expenditures, is most consistent over the longer run with the Federal Reserve's statutory mandate. The Committee ~~would be concerned if inflation were running persistently above or below this objective. Communicating this symmetric inflation goal clearly to the public helps keep~~ judges that longer-term inflation expectations ~~firmly~~ that are well anchored~~, thereby~~ at 2 percent fostering price stability and moderate long-term interest rates and ~~enhancing~~ enhance the Committee's ability to promote maximum employment in the face of significant economic disturbances. In order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages

2 percent over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time.

5. Monetary policy actions tend to influence economic activity, employment, and prices with a lag. In setting monetary policy, the Committee seeks over time to mitigate shortfalls of employment from the Committee's assessment of its maximum level and deviations of inflation from its longer-run goal ~~and deviations of employment from the Committee's assessments of its maximum level~~. Moreover, sustainably achieving maximum employment and price stability depends on a stable financial system. Therefore, the Committee's policy decisions reflect its longer-run goals, its medium-term outlook, and its assessments of the balance of risks, including risks to the financial system that could impede the attainment of the Committee's goals.

6. ~~These~~ The Committee's employment and inflation objectives are generally complementary. However, under circumstances in which the Committee judges that the objectives are not complementary, it ~~follows a balanced approach in promoting them, taking~~ takes into account the ~~magnitude of the~~ employment shortfalls and inflation deviations and the potentially different time horizons over which employment and inflation are projected to return to levels judged consistent with its mandate.

7. The Committee intends to ~~reaffirm~~ review these principles and to make adjustments as appropriate at its annual organizational meeting each January, and to undertake roughly every five years a thorough public review of its monetary policy strategy, tools, and communication practices.

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Some Thoughts on r*: Why Did It Fall and Will It Rise?

Remarks by

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Board of Governors of the Federal Reserve System

at the

Reykjavik Economic Conference

Reykjavik, Iceland

May 24, 2024

Thank you for the invitation to be here and speak to you today.[1]

I want to step away from shorter-term questions about the economic outlook and monetary policy to delve into a subject of longer-term significance—r*. While there are many concepts of r*, I interpret it to be the real policy interest rate that is neither stimulating nor restricting economic activity with inflation anchored at the central bank's inflation target. In the short term, policymakers must judge whether a given policy setting is restrictive or otherwise, and while this judgment is made with some idea of r*, a number of factors can influence the economy in the near term so that the current setting of policy usually differs from the value of r*. At the same time, policymakers continually update their view of the appropriate value of r*. Recently, for example, discussions have focused on whether or not r* has risen, which has important implications for the conduct of monetary policy.

For the purposes of this discussion, I am going to be talking about the long-run, real value of r*, when inflation and employment have reached the Federal Open Market Committee's (FOMC) goals. Because of that, an estimate of r* points toward where monetary policy is headed over the longer run. This is important for policymakers deciding the best way to get there and also for investors and other members of the public who make decisions in the near term based on their expectations of future economic conditions.

Much has been written on this topic, and different methods have been developed to estimate r*. My goal today is not to debate which statistical estimate of r* is best but rather describe what I believe are the economic factors behind the secular behavior of r*.

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

In particular, I want to address two questions. First, what drove the decline in r* over the past 40 years? Second, what are the factors that may cause it to rise? I am certain some of you will disagree with my answers to these two questions, but that is the nature of good intellectual debate and how we advance our understanding of the world around us.

One vital fact about r* is that it is a theoretical concept without any reliable and straightforward way to determine its value. There are economic models that are used to estimate the value of r* and also surveys of market participants or policymakers such as the FOMC's Summary of Economic Projections. But r* is not a precise number, unlike the unemployment rate, which can be measured directly. For these reasons, all of the model and survey estimates come with large degrees of uncertainty.[2] That's why we always need to be humble in citing a numerical value for r*.

One thing that is evident from these different estimates, and additionally clear based on the performance of the economy at different policy settings over the past couple of decades, is that the value of r* changes over time.[3] The change is slow moving, and I tend to think of it as related to the movement in factors that we can see affecting the economy over time. Though hard to precisely measure, having some understanding of the current level of r* is a matter of obvious importance for monetary policy, so I will focus today on factors that have contributed to the apparent decline in r* over the past several decades and look at how they may influence its value going forward.

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[2] Estimates from econometric models, whether using macroeconomic data, financial market data, or both, typically exhibit large uncertainty bands for any given study. And even these estimates are sensitive to model specification, sample period, data revisions, and more. Approaches that emphasize the underlying determinants of r* also have difficulty in identifying shifts in r* because the important movements in these factors typically occur only at very low frequencies. Information from surveys (at least partially) reflects the estimates from all of these approaches and so cannot speak definitively to movements in r*.

[3] One can see the movement in estimates of r* from the models of Laubach-Williams and Holston-Laubach-Williams reported on the Federal Reserve Bank of New York's website at https://www.newyorkfed.org/research/policy/rstar.

To get some indication of how r* has evolved over time, it is helpful to look at the real, or inflation-adjusted, yield of the 10-year Treasury security, the most widely held safe and liquid asset. Let me pause here and explain why this is a good real-world proxy for the theoretical value of r*.

Think of r* as the level of the real federal funds rate once all the cyclical ups and downs of the economy have been factored out, including near-term policy tightening or loosening that sometimes is necessary to move employment and inflation back to the FOMC's goals. Someone buying or selling a 10-year Treasury security must determine the appropriate price (or yield) by thinking about not only the near-term policy rate, but also how the policy rate will evolve over the next 10 years. Thinking about the evolution of the policy rate, most forecasts expect near-term shocks to die out and the economy to move toward the FOMC's goals, so the policy rate—absent future shocks—will move toward and eventually reach r*. This means the 10-year Treasury yield embeds a value of r*. Since 10-year Treasury securities are widely traded, their price (and yield) is reflective of current market views of the value of r*.[4]

With that stipulated, let's look at how the real yield on the 10-year Treasury security has evolved. In figure 1, I plot two measures. One is a series starting in the 1980s using the nominal 10-year Treasury yield and subtracting out the Michigan survey's view of expected inflation over the next 5 to 10 years (the solid black line). The second measure is a market-based measure, Treasury Inflation-Protected Securities, or TIPS, which started trading in the late 1990s (the red dashed line).

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[4] The 10-year real Treasury yield is the sum of current and expected real short-term Treasury yields and a term premium. Both near-term real short rates and term premiums that are affected by current economic conditions must be taken into consideration when teasing out a value of r* from the 10-year Treasury yield.

These series clearly show a downward trend in the real yield of the 10-year Treasury over most of the period, supporting the idea that r* declined over the past 30 to 40 years. Looking at the past few years, the two series show a recent increase. This is the source of recent questions about whether r* has risen, which I will address later.

I want to pause here and show another measure of longer-term interest rates that some people use to gauge the value of r*—the real return on capital. In my view, this is not the appropriate interest rate to use for discussing r* because it includes some measure of riskiness of business activity and is not directly related to the stance of monetary policy. As you can see in figure 2, these accounting-based measures of the realized real return on capital, as measured by the Bureau of Economic Analysis (the black line) or researchers (the blue dashed line), do not show the longer-term downward trend that we saw in the real 10-year Treasury yield. Also, these values have not necessarily moved up in the recent past either. I look at these measures of the return on capital and conclude that, unlike the 10-year Treasury, there is no secular decline in the real return to capital. One could argue about how this private return is measured, but recent work, accounting for a myriad of factors, finds only modest changes in this return.[5]

This divergence—the longer-term decline in the real 10-year government yield until recently and the relatively flat real return on capital—holds across countries. Many researchers have documented the decline in government yields around the world, so I will

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[5] See, for example, Ricardo Reis (2023), "The Future Long-Run Level of Interest Rates," presentation at the SUERF Conference, Vienna, Austria, December, https://www.suerf.org/wp-content/uploads/2023/09/l_c5ab0bc60ac7929182aadd08703f1ec6_47133_suerf.pdf; and Emmanuel Farhi and Francois Gourio (2018), "Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia," *Brookings Papers on Economic Activity,* Fall, 147–223, https://www.brookings.edu/wp-content/uploads/2018/09/Farhi-Gourio_final-draft.pdf.

not here. Meanwhile, figure 3 shows a chart from a paper by Monge-Naranjo and others where the median real return on capital (the white line) across countries has been roughly steady since 1980.[6] And, in fact, the blue region, which represents the dispersion of this return across countries, has narrowed over the years.

To me, these data raise a very clear question: What are the factors or events that have driven a wedge between these two rates of return, causing the real 10-year yield to decline but the return on capital to be relatively constant? And what does this say about r*?

Let me start by discussing what is *not* responsible for this difference in yields.[7] First, it cannot be caused by longer-run trends in productivity. Trend productivity affects the real return on capital first and foremost. So even if trend productivity growth was falling over time, both rates of return would have fallen. But, clearly, the real return to capital has not fallen over time. So falling productivity growth cannot be an explanation.

Second, this difference in yields cannot be the result of declining population growth. Again, this would also lower the real return to capital since there are fewer workers to use productive capital, which means the existing capital stock is underutilized, thereby lowering its real return.

So, what drove the decline of the real return on government debt? It is obvious that what makes U.S. government debt different from the real return on capital and other interest rates is its safety and global liquidity. I will briefly discuss several factors that

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[6] See Alexander Monge-Naranjo, Juan M. Sánchez, and Raül Santaeulàlia-Llopis (2019), "Natural Resources and Global Misallocation," *American Economic Journal: Macroeconomics,* vol. 11 (April), pp. 79–126.

[7] For further review of how different factors are at play, see Ricardo J. Caballero, Emmanuel Farhi, and Pierre-Olivier Gourinchas (2017), "Rents, Technical Change, and Risk Premia Accounting for Secular Trends in Interest Rates, Returns on Capital, Earning Yields, and Factor Shares," *American Economic Review,* vol. 107 (May).

have influenced the supply and demand for safe, liquid assets. I will try to make the case that the demand for safe, liquid assets outgrew the supply over the past 40 years, which drove a secular increase in the price of U.S. Treasury securities and, thus, a secular decline in their real yield. At the same time, the safety and liquidity of U.S. Treasury securities was actually increasing, which made them even more attractive to global investors.

To be clear, I am not focusing on day-to-day movements in interest rates from idiosyncratic events that will ultimately unwind. Instead, I am thinking about factors that have long-term consequences for short-term market interest rates and, hence, r*. I will also consider how these factors may be influencing r*'s value today and in the future.

Let me first explain why I believe the safety of U.S. Treasury securities increased over the past 40 years. By this I am not referring to default risk, which has been and will be zero. By "safer" I mean greater stability in the real return from holding U.S. Treasuries. I believe this occurred for two reasons. First, from 1980 to 2020 there was a significant decline in the level and volatility of U.S. inflation. Second, the Great Moderation during this period meant economic performance in the United States was less volatile, which meant less variability in the monetary policy rate. This lowered the interest rate risk from holding Treasuries. As a result, the opportunity to hold a default-free asset with less risk of inflation and economic volatility made U.S. Treasuries more attractive.

Support for this proposition comes from looking at the term premium on 10-year Treasuries over the past 40 years, as is shown in figure 4. The term premium measures the compensation investors must receive to accept risk from holding Treasuries. As you

can see, there is a clear secular decline in the term premium on 10-year Treasuries. I interpret this to mean that the inflation risk and real risk of holding Treasury securities made them safer to hold as time went on.

Now let me turn to five factors that I believe played a role in causing the demand for safe, liquid assets to grow faster than the supply of these assets, pushing down Treasury yields and r*. Some of these factors are contributing to the downward trend in U.S. longer-term rates, while others affect global longer-term interest rates more broadly.

The first factor is the liberalization and globalization of capital markets starting in the 1990's. This increased the global demand for safe liquid assets to investors around the world who previously did not have access to U.S. Treasuries. Financial and capital markets and trade around the world were liberalized, and information technology saw advances that aided the global movement of capital, which resulted in an explosion of cross-border finance. For example, the share of external financial claims and external financial liabilities as a share of annual global gross domestic product grew from around 100 percent in 1990 to over 400 percent today. That change reflects the fact that an increasingly large share of the world's wealth is invested abroad, much of it in U.S. debt, including Treasury securities. The rise in foreign official and private purchases of Treasury securities resulted in an increase in the price of U.S. Treasury securities, driving down yields.

The second factor causing demand for Treasury securities to grow more than supply was the large buildup of official reserves that started after the reforms that followed the 1998 financial crisis in Asia. One consequence of removing capital controls and other financial market liberalization in other countries over the past 30 years has been

to make foreign governments more vulnerable to sudden capital outflows and financial crises. Many countries have responded by building up their foreign exchange reserves to help weather such stress. Global foreign exchange reserves have increased from around $1 trillion in the early 1990s to $12 trillion today.

Notwithstanding the drumbeat of warnings from some that the U.S. dollar is in danger of losing its primacy in global trade and finance, it remains by a very large margin the world's reserve currency. U.S. government debt, likewise, remains the primary form of low-risk asset, which is reflected in the huge stock of Treasury securities held as foreign exchange reserves around the world. The resulting demand for Treasury securities has contributed to pushing down yields and, thus, lowering r*.

The third factor driving prices up and yields down for Treasuries and similarly affecting r* is sovereign wealth funds. In addition to foreign exchange reserve holdings, sovereign wealth funds from some economies, especially those rich in natural resources, have become an increasingly important way for governments to invest abroad and diversify their national wealth. They are an increasingly significant force in global financial markets. Although sovereign wealth funds are diverse in their holdings, U.S. government debt is typically a sizable share of these funds. Sovereign wealth funds have grown from $1 trillion in assets in 2000 to $11 trillion last year, and a lot of those assets are presumably in U.S. Treasuries. For example, Norway's sovereign wealth fund holdings of Treasuries grew from $5.6 billion to $132.4 billion over this period.[8] The growth in Treasury holdings by sovereign wealth funds has clearly contributed to the decline in Treasury yields.

[8] See Global SWF's website at https://globalswf.com.

The fourth factor that is thought to have influenced Treasury yields and r* over the past couple of decades is the aging of the population in the United States and around the world. The argument here is that as people move past their prime working years, their demand increases for safe, liquid investments that ensure their principal is preserved for their needs in retirement. U.S. Treasuries fill this need. Aging has been driven by the fact that Americans are living longer, and another big factor has been the aging of the large baby-boom generation, born between 1946 and 1964. The share of the U.S. population aged 65 or older has increased from 12 percent in 1990 to 17 percent today, which is 1 in 6 people. There is evidence that the large number of baby boomers who are retired or planning to do so soon has boosted demand for Treasury securities.[9] Outside the United States, population aging is accelerating even faster.

The fifth factor that increased the demand for Treasuries came from many new financial regulations implemented after the 2008 global financial crisis. Regulators in the United States and abroad increasingly wanted banks to hold safer and more liquid assets as part of their balance sheets. For example, the implementation of the Liquidity Coverage Ratio requirement for larger financial institutions in the United States considers Treasury securities preferable to other liquid assets such as mortgage agency debt and mortgage-backed securities. This rule has boosted demand for Treasuries. In the years leading up to the deadline for compliance with the rule, Treasury holdings by large banks

[9] For a model that shows how the evolution of the baby boomer generation has affected r* over the past few decades, see Etienne Gagnon, Benjamin K. Johannsen, and David Lopez-Salido (2016), "Understanding the New Normal: The Role of Demographics," Finance and Economics Discussion Series 2016-080 (Washington: Board of Governors of the Federal Reserve System, October), http://dx.doi.org/10.17016/FEDS.2016.080.

increased notably.[10] Regulators have also focused on the safety and liquidity of U.S. money market mutual funds, and there has been a dramatic shift in this industry away from prime money funds, which hold private debt instruments, to government money funds that hold U.S. Treasury debt obligations. Thus, we saw a significant increase in regulatory-driven demand for safe, liquid U.S. Treasuries over the past 15 years. On top of this, the Federal Reserve shifted from a limited- to ample-reserves regime to implement monetary policy effectively at the onset of the Global Financial Crisis.[11] This regime shift resulted in more Treasury securities permanently held by the Federal Reserve. These policy choices have resulted in higher demand from the public and the Federal Reserve and put downward pressure on yields and r*.

As I mentioned earlier, there has been a lot of debate during the past year as to whether or not r* has increased. If you believe the narrative I have just provided as to what drove down r* over the past 40 years, one must ask which of those factors have reversed. I do not believe any of these factors can explain the possible recent increase in r*, but some may conceivably be a contributing factor to an increase in r* in the future.

Let's consider each factor. First, demographics are such that between 2015 and 2050 the proportion of the world's population over 60 will nearly double from 12 percent to 22 percent. This will continue to put downward, not upward, pressure on r*.

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[10] See figure 1 in Jane Ihrig, Edward Kim, Cindy M. Vojtech, and Gretchen C. Weinbach (2019), "How Have Banks Been Managing the Composition of High-Quality Liquid Assets?" Federal Reserve Bank of St. Louis, *Review,* vol. 101 (Third Quarter), pp. 177–201, https://files.stlouisfed.org/files/htdocs/publications/review/2019/07/12/how-have-banks-been-managing-the-composition-of-high-quality-liquid-assets.pdf.

[11] Policy actions taken at the onset of the Global Financial Crisis caused the Federal Reserve to implement policy with an abundant level of reserve balances in the banking system. It was not until 2019 that the FOMC formally announced its plan to implement policy with ample reserves over the longer run.

Second, is it possible for liberalization of capital markets to reverse due to increased geopolitical frictions? Possibly, but not yet to any significant degree.

Third, is it likely that central banks and sovereign wealth funds around the world will dramatically decrease their holdings of U.S. Treasuries? Not likely, although the growth in their demand may slow. As I have argued more extensively elsewhere, I do not expect the dollar to lose its status or influence anytime soon, and recent developments, if anything, point more to increased influence for the dollar than to any significant decline.[12] On top of this, I don't expect other countries to emerge as substantive issuers of safe and liquid assets to rival Treasuries as an investment, nor any change in the approach of the countries with sovereign wealth funds that would lead them to pull back from their foreign investments.

Finally, is it possible that regulatory pressures forcing financial institutions to hold more safe and liquid government debt will recede and raise r*? The current regulations are likely here to stay, and banks are compliant with the rules. So the growth in regulatory demand for Treasury securities could slow (not increase) substantially. Of course, as financial innovation occurs regulations evolve, so we should watch how this factor as well as all the others can affect r* in the future.

Let's now turn our attention to the supply of Treasury securities and ask if this can possibly explain why r* may be increasing now or in the future. The U.S. government issues Treasuries to finance deficit spending, which obviously impacts Treasury supply. Deficit spending and the federal debt have been increasing since the

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[12] See Christopher J. Waller (2024), "The Dollar's International Role," speech delivered at "Climate, Currency, and Central Banking," a conference sponsored by the Global Interdependence Center and the University of the Bahamas, Nassau, Bahamas, February 15, https://www.federalreserve.gov/newsevents/speech/waller20240215a.htm.

1990s. I believe the factors increasing demand that I just reviewed have outstripped the increase in supply over the past few decades, leaving r* lower. But if the growth in the supply of U.S. Treasuries begins to outstrip demand, this will mean lower prices and higher yields, which will put upward pressure on r*.

It is probably not news to many people that the U.S. is on an unsustainable fiscal path.[13] The latest outlook from the Congressional Budget Office paints a challenging picture of the future, with debt expected to grow at an unprecedentedly high rate for an economy at full employment and not involved in a major war.[14]

All of these financing pressures may contribute to a rise in r* in coming years, but only time will tell how large a factor the U.S. fiscal position will be in affecting r*.

Looking ahead, as a policymaker, it is important to understand what is driving any movement in r* to justify using it to guide my policy deliberations. One cannot simply claim r* has risen based on gut feelings—there must be a reasonable economic explanation for why it has risen or fallen. My objective here today was to provide some arguments for what has moved r* over the past several decades and what could move it in the future.

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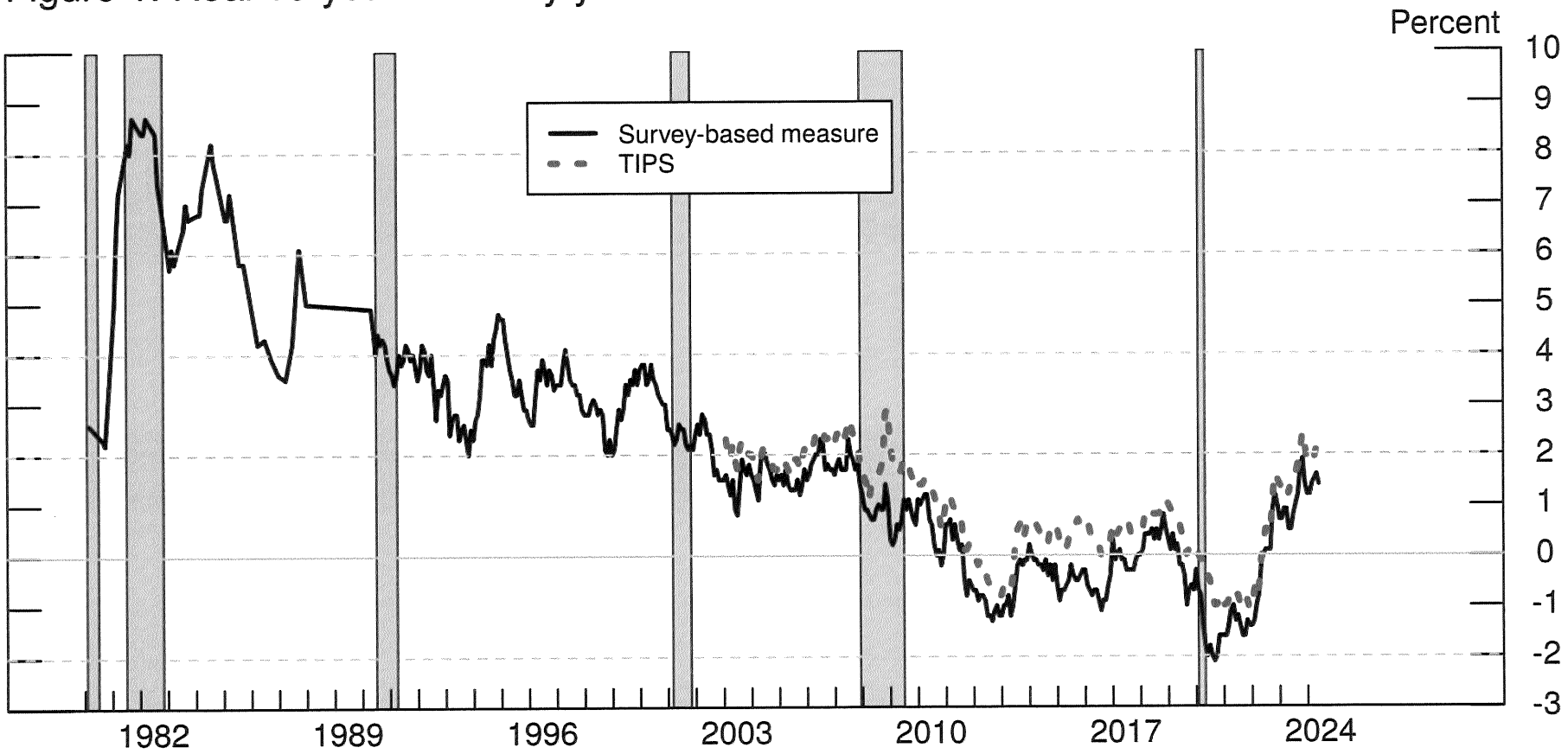
[13] Discussion of growing U.S. deficits is not new. For a discussion of the growing deficit at that time, see, for example, Ben S. Bernanke (2005), "The Global Saving Glut and the U.S. Current Account Deficit," speech delivered at the Sandridge Lecture, Virginia Association of Economists, Richmond, Virginia, March 10, https://www.federalreserve.gov/boarddocs/speeches/2005/200503102.

[14] As reported in February, the Congressional Budget Office projects debt as a share of GDP to reach 116 percent by 2034, which is an amount greater than at any point in the nation's history; see Congressional Budget Office (2024), *The Budget and Economic Outlook: 2024 to 2034* (Washington: CBO, February), https://www.cbo.gov/system/files/2024-02/59710-Outlook-2024.pdf.

Some Thoughts on r*: Why Did it Fall and Will it Rise?

Christopher Waller
Member
Board of Governors of the Federal Reserve System
Delivered at the Reykjavik Economic Conference
Reykjavik, Iceland

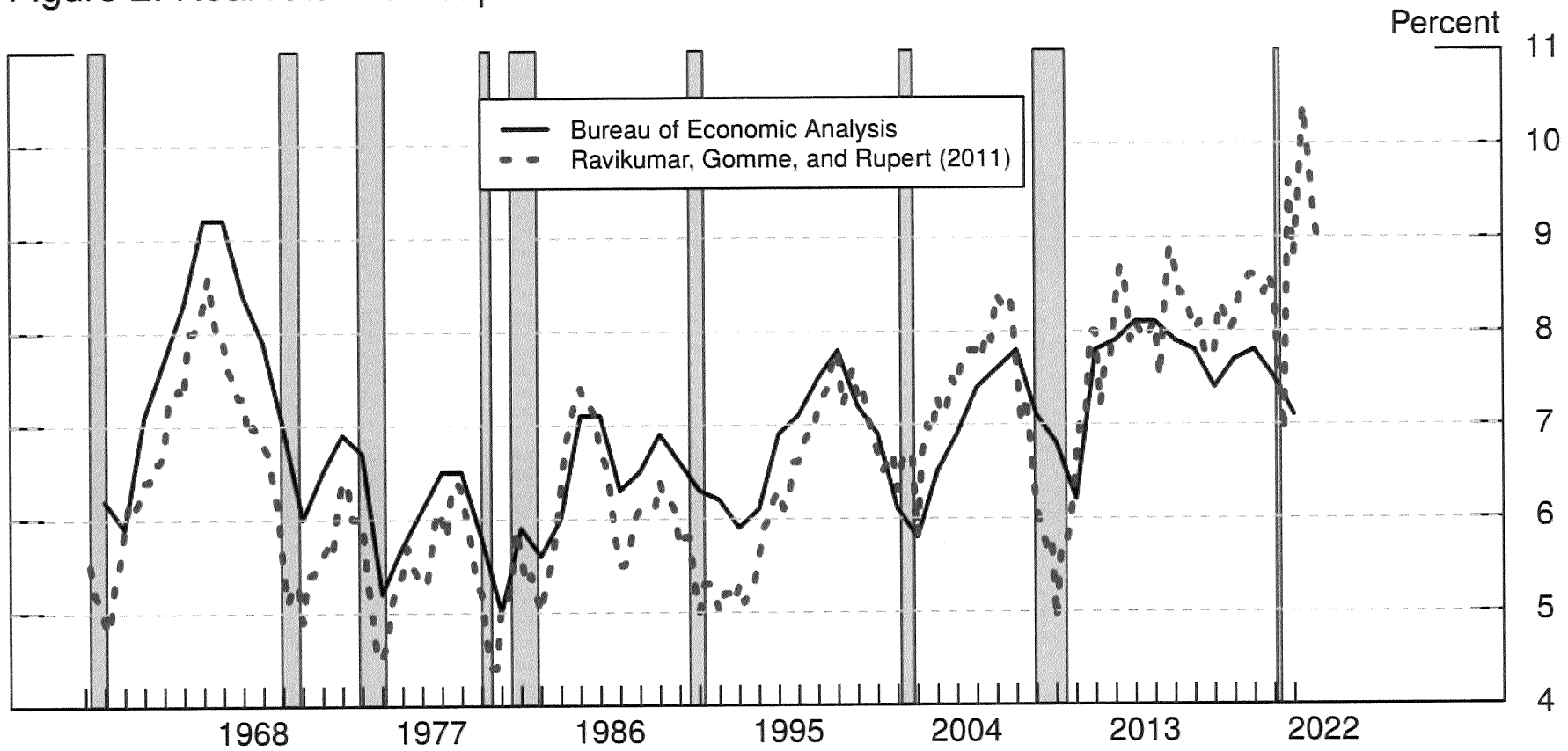
Figure 1. Real 10-year Treasury yield



Note: The survey-based real 10-year Treasury yield is calculated as the nominal 10-year minus the University of Michigan survey of inflation expectations over the next 5 to 10 years. TIPS is Treasury Inflation-Protected Securities. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research (NBER): February 1980 to July 1980, August 1981 to November 1982, August 1990 to March 1991, April 2001 to November 2001, January 2008 to June 2009, and March 2020 to May 2020.

Source: Department of the Treasury; University of Michigan, Survey Research Center, Surveys of Consumers.

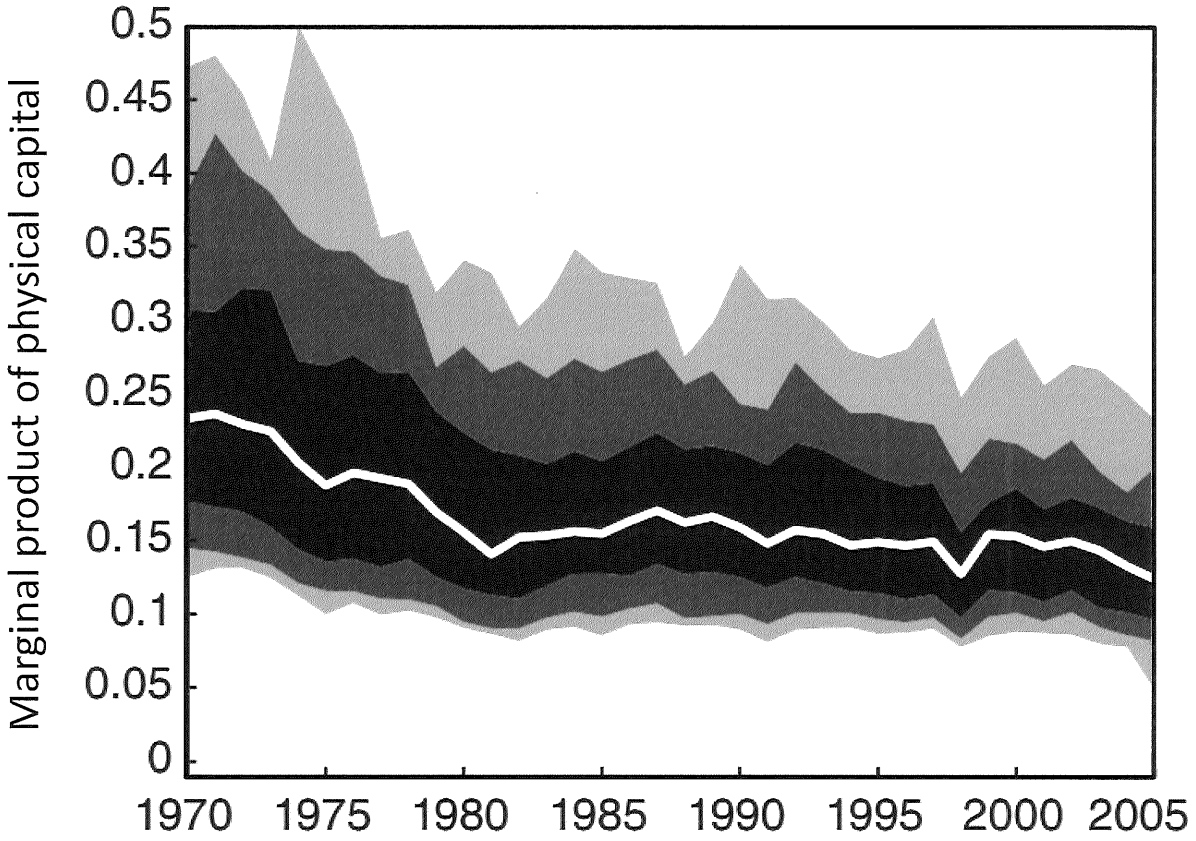
Figure 2. Real return on capital



Note: Both measures are the return on business capital, after tax. Ravikumar, Gomme, and Rupert (2011) includes a constant capital gain. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research (NBER): May 1960 to October 1960, January 1970 to November 1970, December 1973 to March 1975, February 1980 to July 1980, August 1981 to November 1982, August 1990 to March 1991, April 2001 to November 2001, January 2008 to June 2009, and March 2020 to May 2020.

Source: Bureau of Economic Analysis, Survey of Current Business; Paul Gomme, B. Ravikumar, and Peter Rupert (2011), "The Return to Capital and the Business Cycle," Review of Economic Dynamics, vol. 14 (April), pp. 262–78.

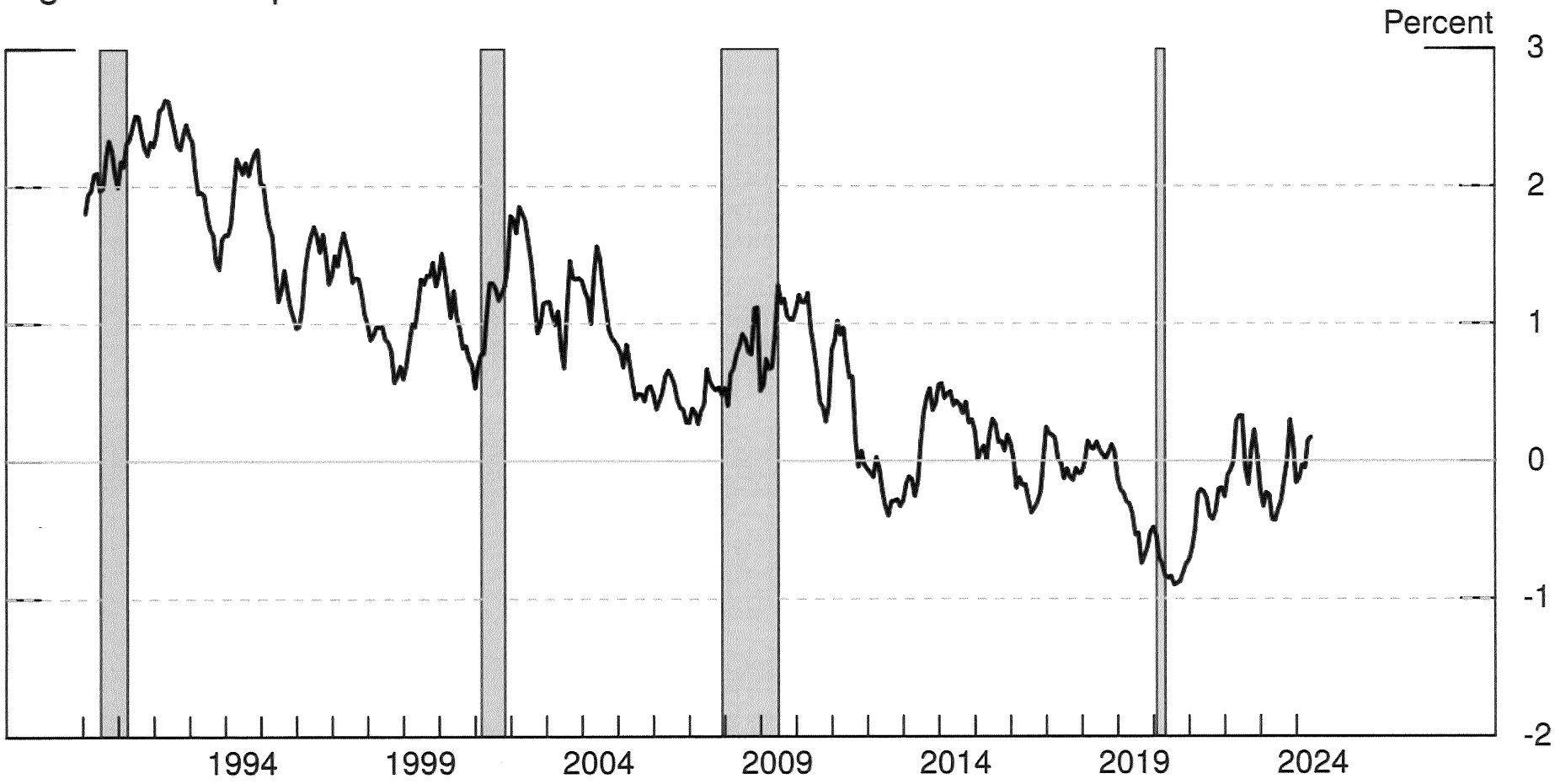
Figure 3. Marginal product of physical capital across countries



Note: White line represents the median; blue shaded areas from the proximity to the median out show the 25th to 75th percentile range, the 10th to 90th percentile range, and the 5th to 95th percentile range.

Source: Alexander Monge-Naranjo; Juan M. Sánchez; Raül Santaeulàlia-Llopis (2019), "Natural Resources and Global Misallocation," *American Economic Journal: Macroeconomics*, vol. 11 (April), pp. 79–126.

Figure 4. Term premium



Note: The term premium is calculated by fitting the Kim and Wright (2005) three-factor arbitrage-free term structure model to the 10-year U.S. Treasury yield. The shaded bars indicate periods of business recession as defined by the National Bureau of Economic Research (NBER): August 1990 to March 1991, April 2001 to November 2001, January 2008 to June 2009, and March 2020 to May 2020.

Source: Board of Governors of the Federal Reserve System.