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What's (Not) Up With Inflation?

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HUTCHINS CENTER ON FISCAL & MONETARY POLICY
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This report is available online at: https://www.brookings.edu/product/explaining-the-inflation-puzzle/

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ABOUT THE REPORT

This report is drawn in large part from an October 2019 conference convened by the Hutchins Center on Fiscal & Monetary Policy at Brookings. Unless otherwise identified, the quotations in this report come from that conference. For video and a full transcript of the conference, see https://www.brookings.edu/events/whats-not-up-with-inflation/.

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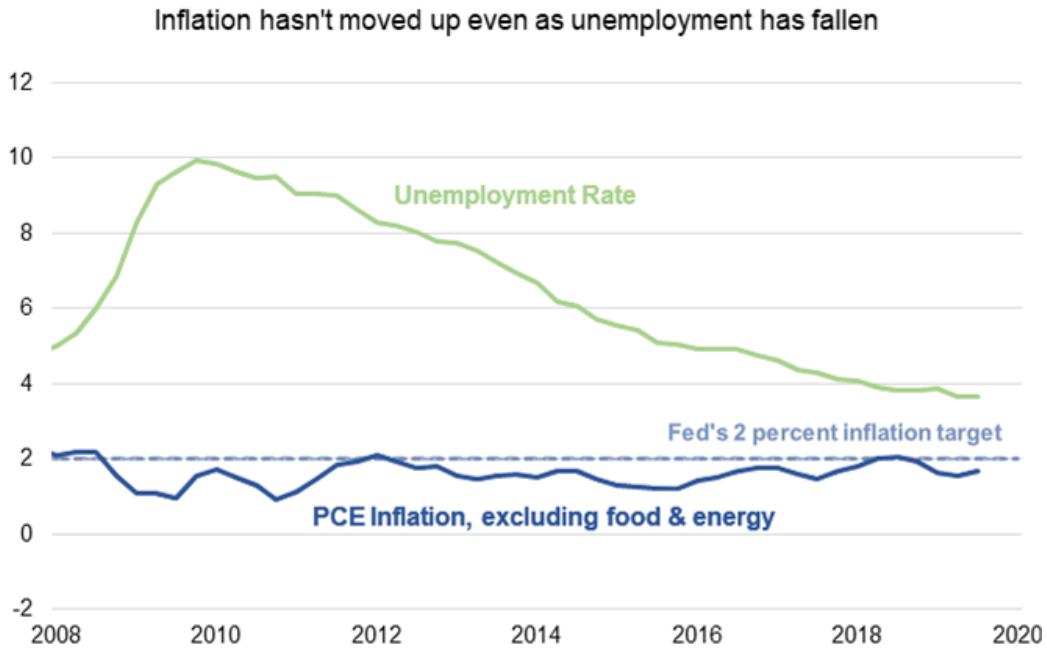
Why the answer to the inflation puzzle matters

Janet Yellen

The following is drawn from remarks by Janet Yellen, former chair of the Federal Reserve Board and Distinguished Fellow in Residence at Brookings, at a public event, "What's (not) up with inflation?" hosted by the Hutchins Center on Fiscal & Monetary Policy at Brookings on October 3, 2019.

My objective is to describe the inflation puzzle and highlight why the answer matters for policymakers and for economic performance.

The main puzzle pertaining to inflation is aptly summed up by the title of this conference: "What's (not) up with inflation?" Inflation hasn't moved up through an expansion that now ranks as the nation's longest on record. Unemployment declined from about 10 percent in 2009 to 3.7 percent today—a 50 year low. Yet headline inflation over the last year, according to the Federal Reserve's Preferred Personal Consumption Expenditures (or PCE) measure, stood at only 1.4 percent in August. Core inflation, which excludes volatile food and energy prices, came in a bit higher at 1.8 percent. The current pace is close to that in 2009. Contrast this experience with that during the long expansion of the 1960s. Unemployment declined from 6.7 percent in 1961 to 3.6 percent in 1969. Over the same period, headline PCE inflation rose from just under 1 percent to roughly 5 percent and core inflation increased by a similar amount.



Note: Percent. Inflation is the percent change from one year prior in the core PCE price index.
Source: Federal Reserve Bank of St. Louis.

The Phillips Curve has long served as the "workhorse" model of inflation and it's used by most economists, including Federal Reserve staff, to analyze and forecast inflation trends. It posits that current inflation depends on the degree of labor market slack, on lagged inflation, and on a variety of supply shocks, including those affecting the prices of food, energy and other commodities, and the value of the dollar, which affects import prices. Various transitory factors or noise also affect inflation readings. The

comparison I just described concerning the behavior of inflation as unemployment declined during the current expansion and that of the 1960s illustrates two robust empirical findings. First, the slope of the Phillips Curve—a measure of the responsiveness of inflation to a decline in labor market slack—has diminished very significantly since the 1960s. In other words, the Phillips Curve appears to have become quite flat. And second, inflation has become much less persistent, because the impact of lagged inflation on current inflation has declined considerably. This likely reflects the fact that inflation expectations, which affect wage and price setting, now appear to be quite stable and unresponsive to variations in actual inflation. Inflation expectations, in other words, have become well-anchored. During the 1960s and 1970s, in contrast, a rise in actual inflation appeared to boost inflation expectations considerably. High responsiveness of inflation expectations to actual inflation works to boost the longer-term response of inflation to changes in labor market slack considerably. In fact, it creates the possibility that a temporary decline in unemployment below the natural rate, or a transitory supply shock, results in a permanent increase in the rate of inflation—a so-called accelerationist Phillips Curve.

Note: Percent. Expected inflation is the mean of forecaster's expectations for CPI inflation for the following year (CPIB).
Source: Federal Reserve Bank of Philadelphia.

An important question is just why the relationship between inflation and unemployment has become so attenuated—in the view of some observers, almost nonexistent—and our presenters today will consider some possibilities. One possibility is that labor market slack is not appropriately measured by the civilian unemployment rate. Perhaps broader measures of slack including, for example, individuals involuntarily working part-time or some who are considered to be out of the labor force entirely are relevant to wage and price inflation. The willingness of individuals considered to be out of the labor force to enter in response to strong opportunities may also restrain inflation. Prime age labor force participation has declined considerably in the United States. It moved up during the expansion but, even now, remains roughly half a percent below its level just prior to the Great Recession. Another possibility is that the flatness of the Phillips Curve reflects downward rigidity of nominal wages: firms are generally reluctant to

impose wage cuts on their employees and, during the early years of the Great Recession, wage inflation fell very little. Perhaps for this reason, both wage and price inflation were restrained during the recovery. The flatness of the Phillips Curve might also reflect global influences with increased trade, slack in foreign economies, and the prevalence of global supply chains attenuating the influence of domestic factors on inflation. Conceivably, the flattening of the Phillips Curve reflects technological or market structure factors, such as the ease of price comparisons over the internet, resulting in declining price power for domestic firms. It's also possible that the flatness is a statistical mirage: the success of policymakers in achieving low and stable inflation, in part by accepting higher unemployment when supply shocks are pushing inflation up, could be masking a true relationship between inflation and unemployment that is stronger than it appears to econometricians. Finally, the success of policymakers in holding inflation low and stable in recent decades could explain the decline in the persistence of inflation which, in effect, flattens the slope of the longer-run Phillips Curve. Longer-term inflation expectations, as measured for example by the Survey of Professional Forecasters, have been remarkably stable in the vicinity of 2 percent. Such well-anchored inflation expectations may have been fostered by the Fed's adoption of a numerical inflation objective of 2 percent in 2012, preceded by a long period during which the Fed was committed to first bringing inflation down from unacceptably high levels and then maintaining inflation in the general vicinity of 2 percent.

What difference does it make, from a policy perspective, if the Phillips Curve has flattened and if inflation has become less persistent? If the Phillips Curve is very flat, and if inflation expectations are insensitive to fluctuations in actual inflation, the Federal Reserve may be able to run the economy hot, yielding significant benefits to workers, while imposing only minimal costs on society in terms of the higher inflation. Indeed, given that inflation has been so very low for so long—it's averaged on 1.5 percent over the last decade—it may be necessary to have a hot labor market for inflation to move back to 2 percent on a stable basis. Allowing the labor market to run hot could bring substantial benefits. As Brookings economist Arthur Okun observed in 1973, in an early volume of *Brookings Papers on Economic Activity*, a high-pressure economy improves upward mobility. We're seeing that in the current expansion. Those who are least advantaged in the labor market—those with less education and minorities—are experiencing the largest gains in wages and declines in unemployment. Moreover, when firms find it hard to hire they tend to lower qualifications and provide more training. We're seeing more partnerships with community colleges and local governments to develop job market programs with promised employment to those who successfully complete them. In slack labor markets, those who "check the box" indicating a criminal record, have little chance to find work: their resumes end up quickly in the circular file. In today's strong labor market that's changed and such individuals are getting a chance to turn around their lives. It's possible, albeit uncertain, that the skills and experiences these individuals are acquiring in today's tight labor market will yield long-run benefits—enabling them to do better even if the economy experiences another downturn.

A significant benefit of better anchored inflation expectations is that they enable the Federal Reserve to all but ignore the inflationary impact of supply shocks in their conduct of monetary policy, mitigating the need for monetary policy to tighten, with negative impacts on employment, following adverse supply shocks. Well-anchored inflation expectations, in effect mitigate what might otherwise be painful conflicts between the Fed's inflation and employment objectives. Indeed, over the last decade, US monetary policy has barely responded to movements in inflation driven by oil prices, the dollar, and other supply factors. For example, after a multiyear sequence of unanticipated oil price increases between 2004 and 2008, inflation reverted to its previous trend once oil prices stabilized. Similarly, inflation moved back up to 2 percent in 2018 after several years in which declines in oil prices and a marked appreciation of the dollar pushed inflation below the Fed's target. In contrast, in 1973 and again in 1979, oil prices jumped

markedly, producing sharp inflation spikes. In those episodes, inflation appeared to move permanently higher even after oil prices settled down.

It's important to point out, however, that a flat Phillips Curve has a downside, which is that it raises the so-called "sacrifice ratio." The sacrifice ratio measures the cost in terms of higher unemployment to lower inflation should it rise too high. With a flat Phillips Curve, it's necessary for monetary policy to create a good deal of slack in the labor market to return inflation to levels consistent with price stability. And if the flatness of the Phillips Curve is a statistical mirage rather than a true change in the economy's structure, an attempt by policymakers to exploit it could push up inflation much more than they expect. Finally, even if the Phillips Curve is quite flat over some range, it's conceivable that it could become a lot steeper if unemployment is pushed to very low levels: that is, it may be nonlinear at very low unemployment. There is some evidence of such nonlinearity, so it's a significant policy concern.

Another policy consideration pertains to inflation persistence. Can we count on such low persistence going forward? Or might inflation revert to its earlier behavior if policymakers attempt to exploit the current benign inflation dynamics to keep unemployment low or push it yet lower? If the decline in inflation persistence reflects increased credibility of monetary policy, this valuable asset could be squandered if monetary policy persistently allows inflation to deviate from its 2 percent objective. As in the 1970s, a willingness of the Fed to tolerate inflation persistently above 2 percent could ultimately de-anchor and boost inflation expectations. Alternatively, and arguably the more relevant consideration today, a chronic failure of the Fed to stably achieve its 2 percent target could de-anchor inflation expectations on the downside, exacerbating the problems associated with the zero lower bound on policy rates and creating significant deflationary risks.

To conclude, our panelists will address questions that are vitally important for economic policy and economic performance in the years ahead and I look forward to today's discussions.

Explaining the inflation puzzle

Sage Belz & David Wessel

Inflation in the U.S., as Janet Yellen explains, is behaving differently than it did in the past, challenging standard economic theories and contributing to the Federal Reserve's decision to keep interest rates unusually low even as unemployment has fallen to a 50-year low.

In the 1960s, low unemployment pushed up wages and consumer prices. In the 1970s, high oil prices sparked self-fulfilling beliefs that other prices would rise rapidly. In the 1980s, a severe recession with unemployment that peaked at 10.8 percent brought inflation down from historic highs.

In contrast, inflation has been low and relatively stable in the last three decades. Inflation, excluding food and energy prices, fell and remained below the Fed's 2 percent target during the sluggish recovery from the 2007-9 recession.

This raises a few big questions: what explains the changes in inflation trends? Is this a temporary phenomenon or a long-lasting one? And how should monetary policy respond? This report summarizes answers to those questions offered by several prominent economists.

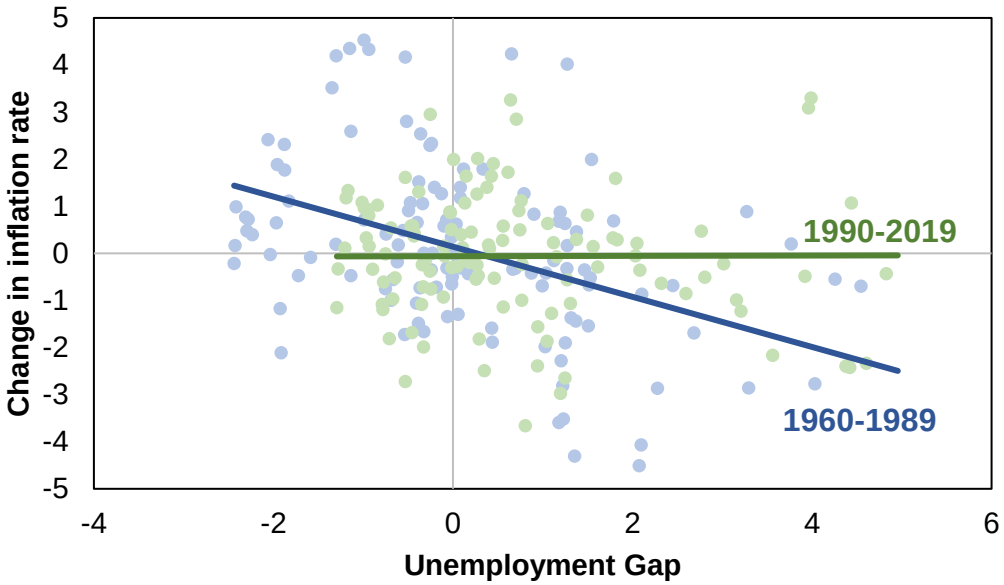
The Phillips Curve

The behavior of inflation has focused attention on the Phillips Curve, the statistical relationship between the rate of inflation and slack in the labor market, among other variables such as inflation expectations, oil prices and exchange rates. The key intuition for the Phillips Curve is that when times are good and there are few idle workers, wages and other input costs rise more quickly, putting upward pressure on inflation. The relationship is named for economist William Phillips, who observed in the 1950s that wages in the United Kingdom tended to rise more rapidly when the unemployment rate was low and stagnate when the unemployment rate was high.

Today, the Phillips Curve is a cornerstone of models that economists at the Fed and elsewhere use. Monetary policy's ability to influence and stabilize inflation hinges on a link between prices and economic activity.

In the 1970s and 80s, the Phillips Curve for the United States was steep—that is, price inflation appeared to be very sensitive to the amount of labor market slack. But, beginning in the 1990s, the correlation weakened and old Phillips Curve models stopped performing well. Indeed, some economists today argue that unemployment, often deemed the most reliable measure of slack in the labor market, has essentially no relationship with consumer price inflation.

Figure 1. The Phillips Curve has flattened since the 1980s



Sources: Federal Reserve Bank of St. Louis, Congressional Budget Office (CBO).

Note: Y-axis is the 4-quarter change in the PCE inflation rate; X-axis is the difference between the unemployment rate and CBO's estimate of the natural rate of unemployment (NAIRU).

What explanations have been offered for the flattening of the Phillips Curve?

It's inflation expectations…

Professional forecasters and financial market analysts today generally believe price inflation will run at the Fed's 2 percent target over the medium run. As a result, businesses may not respond as much as in the past to changes in economic conditions, anticipating whatever movements in inflation that might occur will dissipate quickly. Says former Fed Chair Ben Bernanke: "30 or 40 years ago, if there was a shock to inflation, a significant part of that shock was permanent. It would stay away from its initial point for a sustained period. Whereas, since the '90s, if there's a shock to inflation … you go back to the underlying level and that's consistent with a world in which inflation expectations have been well anchored." Bernanke argues that central banks' focus on anchoring expectations has been the "most important factor over the long haul" in the behavior of price inflation.

It's monetary policy…

Monetary policy may be obscuring the Phillips Curve for consumer prices. Bank of England economists Silvana Tenreyro and Michael McLeay suggest that the statistical correlation between unemployment and inflation will disappear if a central bank reacts to changes in unemployment in order to keep inflation on target—for example, by lowering interest rates to boost the economy when unemployment is rising and threatening to reduce inflation. Under this hypothesis, the perceived flattening of the Phillips Curve is an illusion induced by the Fed's success at keeping inflation relatively stable for the last three decades. In support of their hypothesis, Mcleay and Tenreyro and other researchers have provided evidence that in U.S. cities and states, which don't have their own central banks, inflation looks about as sensitive to unemployment today as it did in the 1990s and 1980s.

It's changes in the labor market…

Changes in the labor market may have restrained wage growth, reducing inflationary pressures.

Wages were slow to rise during the recovery from the Great Recession even as the unemployment rate fell steadily. Some analysts argue that the unemployment rate isn't as reliable a gauge of tightness in the labor market as it once was. After the Great Recession, for example, the unemployment rate may have understated the number of people willing to work. Accounting for these workers could explain why wages were slow to rise. Jared Bernstein, a senior fellow at the Center on Budget and Policy Priorities, argues the job market has yet to reach full employment even today. "That may sound somewhat controversial given how low unemployment is … but I think a sort of first order simple realization is that we're not yet at full employment," he says.

The weakening power of unions in the private sector and increased global competition may have suppressed wage growth, reducing workers' abilities to negotiate for higher wages. "Worker bargaining power has just been so severely diminished that it's going to take not just low unemployment but very low unemployment for a very long time" to raise wages enough to generate inflation, says Bernstein.

But several researchers find that the link between unemployment and wages hasn't changed all that much – once they take account of recent subdued growth in productivity, or output per hour of work. Over time, wages generally keep up with productivity growth. After accounting for low productivity growth in recent decades, the pattern of wage growth since the Great Recession looks a lot like previous labor market expansions. In other words, the Phillips Curve for *wages* – the relationship between low

unemployment and higher wages – looks more intact today than does the Phillips Curve for *consumer prices*.

That leads to a big question: why hasn't wage growth passed through to prices? As Federal Reserve Board economist Katia Peneva says, "There is something else going on in the price Phillips Curve that does not come from … changes in bargaining power or the right measure of slack." The disconnect between wage and price growth today remains a puzzle for economists.

Maybe it's trade and global value chains…

Changes in the global economy may have suppressed inflation in the U.S. even while unemployment has been declining. For one, increased trade and deeper global value chains may have reduced the sensitivity of consumer price inflation to *local* labor market conditions. Kristin Forbes of MIT Sloan School of Management shows that as countries' exposure to imports increases, the domestic Phillips Curve relationship for headline inflation weakens, suggesting that domestic producers may be keeping prices low because they compete with foreign firms. "Import exposure explains over half of the flattening of the Phillips Curve. So, that shows globalization not only has direct immediate effects on inflation but does affect this Phillips Curve relationship with slack," she says.

In addition, integration of global markets can mean changes in global economic activity have larger direct effects on domestic inflation. Consumer price inflation (CPI), a broad measure of prices in a typical consumer's basket, moves much more closely with global economic variables today than in the past. Forbes argues this has to do with both the size of the global shocks affecting domestic inflation and the sensitivity of domestic inflation to those shocks. For example, she explains, "Increased trade integration would mechanically mean a higher share of price indices are for imports. And therefore, prices would be more related to changes in global demand and supply. Or take the fact that emerging markets now have a greater heft in the global economy. So, shifts in demand in emerging markets increasingly drives shifts in commodity prices. It's driven larger movements in commodity prices and oil prices over the last decade and that increase in volatility and commodity prices and energy prices could feed through into prices in advanced economies."

While these changes don't explain why the Phillips Curve has flattened, they can help explain some episodes of low CPI inflation in the United States in the last decade. For example, Forbes provides evidence that during the labor market recovery after the Great Recession, inflation was dragged down by a strong dollar, a slump in oil and commodity prices, and the rebuilding of global supply chains after the crisis.

It's technology-fueled changes in the way companies set prices…

Changes in technology and firms' pricing behavior have also changed the inflation process and complicated efforts to measure its relationship to labor markets. Harvard Business School professor Alberto Cavallo shows, for example, that with the advent of online retail and sophisticated pricing algorithms, firms began to update their prices much more frequently than in previous decades. In addition, prices for goods have become significantly more uniform across retailers in the last decade. "I think this is because of pricing algorithms and the ability also to monitor what the others are doing in trying to mimic their behavior," says Cavallo. "Many of these online retailers have a single price, people have come to expect that they're going to get the goods quickly in just a matter of days, and that there shouldn't be any difference in the prices that they observe if they're in Boston or San Francisco." Together, these changes mean retailers are much more likely to pass changes in oil prices and the exchange value of

the dollar on to consumers via online retail prices. As a result, inflation may be more sensitive to these kinds of national shocks than standard models assume.

Maybe traditional inflation statistics aren't fit for measuring the Phillips Curve?

Changes in pricing behavior might render the traditional inflation statistics unfit for measuring the Phillips Curve. "We have statistical methodologies that are based on a very different type of environment," says Cavallo. "The frequency of pricing is increasing but in particular, the rotation of products [is also] changing." To the extent that standard inflation measures don't capture frequent price fluctuations or changes in the goods that consumers purchase, they may prevent econometricians from properly measuring the Phillips Curve.

Shifts in the industrial composition of the economy can similarly complicate the use of traditional inflation statistics. For example, as health makes up an increasingly large share of the economy, prices of health services (which are affected by policy and technology developments) make up a larger share of the standard inflation measures economists consider. Research from Cleveland Fed economists suggests that after accounting for idiosyncratic pieces of inflation like health, the Phillips Curve relationship between unemployment and price inflation looks strong. Cleveland Fed President Loretta Mester argues further that distinguishing between the *cyclical* movements in inflation and those that are due to structural changes in the economy helps uncover the Phillips Curve. Researchers Lawrence Ball and Sandeep Mazumder have similarly argued that traditional measures of core inflation, which filter out inflation from food and energy but not other industry-specific price fluctuations, are too volatile to capture labor market-induced changes in inflation. They show that a measure of median inflation across industries, which is less volatile than the standard core inflation series, is closely related to unemployment in a manner consistent with old Phillips Curve models.

What does all this mean for the Fed and other policymakers?

Anchored inflation expectations, the integration of global economies, and changes in firm pricing patterns all suggest tight labor markets (by conventional measures) may produce less inflation today than in the past. If so, the Fed and other central banks can pursue easier monetary policy without risking an unwelcome increase in inflation. As Jared Bernstein asserts, if managed properly, a flat Phillips Curve may be particularly beneficial for low-wage workers, who tend to see the greatest wage gains when unemployment is low.

But do these changes demand a rethink of the current monetary policy framework?

On the one hand, low inflation coupled with low interest rates, like the U.S. has seen since the Great Recession, limits the Fed's ability to fight recessions by cutting interest rates; there simply is less room to cut nominal interest rates before hitting zero. A flatter Phillips Curve would make it more difficult for the Fed to meet its inflation objective – it would take bigger rate cuts to push below-target inflation up and bigger rate increases to push above-target inflation down. Some economists and former Fed officials have argued that these factors warrant raising the Fed's inflation target or changing its framework to systematically pursue more inflation-friendly policies after recessions. The Fed is currently in the process of reviewing its monetary policy framework.

On the other hand, the observed change in the Phillips Curve *by itself* may not warrant a change in the policy framework. For one, researchers have identified several factors that indicate the perceived flattening of the Phillips Curve is much less dramatic than simple correlations suggest: changes in

inflation expectations, monetary policy, and persistent slack since the Great Recession could all be working to mask an underlying, steep Phillips Curve. If so, monetary policy can still lift inflation by boosting labor markets. Central banks that fail to account for these confounding factors could risk elevating inflation beyond their goals and de-anchoring inflation expectations.

In addition, many of the forces muting inflation today may be temporary. Global changes that have muted inflation in the last decade could also dissipate in the near future. "World slack, which had been dragging on inflation in a meaningful way [after the recession], isn't dragging as much," says Forbes. "Global value chains, especially as trade tensions are flaring up and companies are reducing their reliance on this sort of network of global supply chains, could be an important factor no longer keeping inflation down which hasn't been fully incorporated in most of our standard models." Cavallo and Forbes argue central banks should extend traditional Phillips Curve frameworks to incorporate more of these global variables when forecasting and analyzing inflation.

Or perhaps the economy may not have reached the level of employment at which inflation will kick in yet. But estimating what that point is remains a challenge for the Fed. As Katia Peneva of the Federal Reserve Board says, "In the morning I worry we are never going to get to 2 percent [inflation]. We have to do something. In the afternoon I think, 'What if [the relationship] is nonlinear? What if we lose control of inflation expectations and we overshoot?'"

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