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Good afternoon. It's my pleasure to be back for a second year to speak at the invitation of Kathleen Murphy, whom many of us at the Richmond Fed and in this room have long worked with and admired.

Let me begin with the obligatory caution. Last year I spoke quite literally on behalf of the president of the Richmond Fed. This year I was actually the one invited — so I need to be clear I'll be speaking entirely on my behalf: The following remarks are my own and do not necessarily represent the views of the Richmond Fed or those of the Federal Reserve System.[1]

It's about as early in the year as one can give a speech, and this means that I'll use my time to lay out some of what I see coming in both the near and slightly longer terms. But first, let's take stock of the year we just left behind.

For the year as a whole, GDP growth — the usual measuring stick of macroeconomic performance — was solid. Growth is likely to come in at about 2 ½ percent for 2017, which is a distinct improvement from the 2.1 percent average rate of growth over the previous seven years. In postwar U.S. economic history, such tepid growth outside of recessions was unknown, a state of affairs that led to a great deal of thinking and handwringing among economists, policymakers and economist-policymakers. I'll return to the question of our longer-run growth prospects in a bit. Coming back to 2017, though, the pickup in growth for the year was balanced and wide-ranging. Consumption and investment were both strong.

Recent Data and Macroeconomic Perspective

Though the data revisions have not yet been finalized, it's likely that consumption grew about 2.7 percent for the year as a whole — a cause for optimism for the year ahead. Why is that? Consumption measures household spending on goods and services that provide benefits in the present. In the U.S. economy, these expenditures make up almost 70 percent of the value of goods and services produced by the economy in a typical year. (In other words, we make a lot of stuff for the here and now.) Consumption is also fairly smooth; it deviates from its longer-run trend only about two-thirds as much as GDP does. For this reason, present consumption often serves as a useful predictor of future consumption — and thus of GDP itself.

Consumption is smooth because that's how households want it. Individually, and as a result collectively, we work to shield ourselves from abrupt changes in our standard of living. In the

face of disruptions, we may try to pick up extra shifts at work, pare back on big-ticket purchases, or make other adjustments to maintain our enjoyment especially of nondurable goods and services, items that constitute almost 40 percent of GDP. These adjustments show in the macroeconomic data, which means that the macroeconomy's behavior inherits or reflects the motivations of what is, ultimately, its key constituency: the consumer.

Another important component of the U.S. economy — about one-sixth of GDP in a typical year — is investment. While consumption measures goods and services we use in the present, investment measures the production of goods and services that augment our ability to produce goods and services in the future. Roughly two-thirds of investment, and hence about a tenth of total value produced in a year, is in the category "fixed nonresidential" items. This includes all the things we see in the hinterlands surrounding any major U.S. city — warehouses, tractor trailers, railyards, etc. Investment also includes the value of intellectual property, a critical source of production in our modern world.

Investment has been especially robust lately. Over the last four quarters, business spending for equipment, structures and intellectual property grew by about 4 ½ percent, well above the growth rate of GDP. In thinking about this strong performance, it is important to note that over time, whereas consumption tends to be smooth, investment is often bumpy. This makes sense if you think about the nature of investment; businesses have to take advantage of opportunities as they present themselves. By virtue of this volatility, fluctuations in investment account for most of the fluctuations in GDP around its trend. For the same reason, today's investment carries far less signal about tomorrow's.

So if most of us strongly prefer stable lifestyles but, when we have our investor hats on, demand swift exploitation of profitable opportunities, which side "wins"? The answer in the data is unambiguous: Consumers rule! Most of what we produce is for immediate consumption, after all. As a result, U.S. GDP growth inherits that smoothness, as does GDP growth in essentially every other developed economy in the world, and even that of major developing ones like China and India.

Shocks

Now, I just said that companies take advantage of investment opportunities as they arise. So we have to ask, can we foresee why the economy as a whole experiences variation in these opportunities? Here I will immediately disappoint: No. We won't always be able to. As Tolstoy famously wrote, all slumps are slumpy in their own way. No, Tolstoy didn't write that, but you get the point: Shocks are a dominant source of business cycles, shocks can come from many places, and shocks rarely tell you they're on the way.

But looking at our own past and across countries, we can make some progress toward understanding the economy's susceptibility to shocks by putting those shocks into boxes. A first box is sharp changes to prices for inputs, such as crude oil. Such price spikes have, interestingly, preceded every U.S. recession since the early 1970s. A second box is sharp changes in government expenditures, most obviously those associated with war, but also those arising from fiscal policy changes more generally. And a third box is monetary policy itself. Careful empirical

analysis of the postwar record places some blame for economic downturns on Fed policy, particularly in the wake of rapid tightening of monetary policy to forestall inflation. The same line of research, however, also gives the Fed some credit for hastening recoveries from shocks.[2]

Fed Performance in Recent Times

Of course, the Fed's objective is not to influence the business cycle per se. Rather, the Fed has two more specific objectives: price stability and maximum employment. Let me now speak to how the economy might be considered to be performing with regard to these objectives.

Regarding price stability, the Fed has taken this to mean low and stable price inflation — 2 percent growth in the PCE price index, to be exact. For several years now, inflation has been below this target, on the order of 50 basis points or so. Even measures that exclude the more volatile food and energy components have stayed below the target we have set for ourselves. As Chair Yellen has noted, it is not entirely certain why this underrun has occurred, but transitory factors clearly have some culpability especially in the past year. For that reason, the FOMC has expressed confidence that inflation will return steadily to its target as these forces dissipate, as transitory forces must. I share this view and expect that inflation over the next year will, slowly, return to the targeted level. In saying this, I am also informed by the relative stability, at near two percent, of longer-run inflation expectations, which in modern macroeconomic thinking play a vital role in actual realized inflation.

What of employment, then? I'll begin by noting that an index developed by the Richmond Fed's research department suggests that overall labor utilization has recovered to levels not seen since the crisis. This index tells us that unemployment, even allowing for those who are working less than they wish, is now at historically low levels and is likely to head into territory that most economists, including myself, regard as lower than can be expected to persist indefinitely even absent any adverse shocks.

Looking Ahead: Policy

How are things likely to unfold in the coming year? To answer that question, let's review a few relevant facts. First, real GDP has increased by a solid 2.3 percent over the last four quarters. This growth has generated over 2 million jobs. Since employment growth has been well above relevant measures of population growth, labor markets have tightened further; the unemployment rate was 4.1 percent in December. And I just noted, even broader measures of unemployment show a return to precrisis levels.[3] Inflation has continued to run somewhat below the FOMC's 2 percent target. Moreover, even after the FOMC raised its federal funds rate target three times last year, the top of the current target range, 1.5 percent, sits slightly below the inflation rate. Thus the real interest rate is near, or slightly below, zero, a historically unusual situation.

Under these conditions it is widely believed that the FOMC will further raise rates this year. The logic is straightforward. Real growth is likely to be fast enough — in my view, slightly exceeding 2 percent in 2018 and then falling back to near 2 percent in 2019 and beyond — to boost employment and further tighten labor markets. Inflation is likely to move toward the

FOMC's 2 percent target. So some movement toward more normal interest rates seems like an easy call.

How much could rates increase? That's where views diverge. Four times a year, FOMC members submit economic projections (which you might have heard referred to as "dot plots.") Each submission includes what the member believes is an appropriate path for the federal funds rate, given his or her own projections for output, employment and prices. In December, the median projection was for three quarter-point increases in the target fed funds rate in 2018. However, one submission had the funds rate falling by a quarter point from the current level, while another had the funds rate rising five times this year. With this wide range of views, I am very confident members will have some interesting discussions at this year's FOMC meetings.

Looking Ahead: The Balance of Risks

Having described some recent data and my outlook for the coming year, I'd like to discuss several features of the current environment that I think warrant attention. First, I began my talk by noting just how slow U.S. growth has been in the past decade or more. In the long run, economic growth is almost exclusively governed by growth in what economists refer to as "total factor productivity" or "TFP" for short. Simply put, TFP is a measure of our society's ability to convert inputs into output. Careful empirical work suggests that TFP growth has slowed substantially, arguably starting well *before* the Great Recession.[4] There are a variety of potential explanations. One that strikes me as especially plausible is the marked slowdown in aggregate skill acquisition, which now may be hindering our ability to take advantage of new technologies.[5] There is also a strand of thinking that the glory days of persistent 3 percent GDP growth (roughly, 2 percent per-person income growth) are over. When comparing the transformative changes in American life between the late 1800s and the WWII period, some prominent economists have argued that the innovations with the most productive potential may have already been invented and put into use.[6]

TFP growth matters for monetary policy for a simple reason: Long-run interest rates are tied to it. Low TFP growth means, all else equal, that long-run real — that is, inflation-adjusted — interest rates will be low over time, and vice versa. In conventional monetary policy thinking, appropriate interest rate setting by the central bank should be tied to measures of a long-run real interest rate known to us as the "natural" rate of interest.[7] Broadly speaking, when that rate is low, the rate set by central banks should also be low. The punchline here is that the rates chosen by central bankers in the future may well be lower on average than the ones chosen in years past.

The possibility that appropriate interest rates may well be lower in the future raises the chance that the "zero lower bound" might constrain the Fed's efforts to accommodate future shocks. As a reminder, this is the limit that keeps central banks from lowering their policy interest rate too far below the zero interest rate that consumers and businesses can obtain simply by holding onto cash. This opens the door to considering broader types of policies, such as quantitative easing and "forward guidance," which we've seen in recent years. Given the uncertainty around the potency and precision of these tools, prolonged periods of low interest rates make monetary policy more complicated.

It's worth noting, however, that the zero lower bound episode that lasted from late 2008 until the end of 2015 coincided with an expansion that has now reached its ninth year —– a time during which the relatively slow pace of growth has arguably been due to (productivity) factors beyond the control of monetary policy. Further, during this time, the public's confidence in the Fed's ability to reach its inflation goal over the long run (as measured by inflation expectations) has remained largely intact.

The low level of current long-term rates and the possibility that future rates may stay low raise the chance of the yield curve — which collects the yields on bonds of varying maturity — staying very flat in the long run. In and of itself, the slope of the yield curve may not carry an independent signal for a central bank, but it certainly could portend a situation where the long yield falls below the short one. This is known as an "inversion" of the yield curve. Though no clearly causal mechanism has been established, one interesting fact is that such inversions are associated — with substantial accuracy — in predicting future downturns. That said, recent yield curve "flatness" may derive more from reductions in inflation-risk premia and other forces than from underlying harbingers of a slowdown.

An additional risk in a low interest rate environment is that such settings are, historically, connected to high asset prices that some observers have characterized as "bubbly." In the coming years, financial supervisors may need to worry about financial stability risks in ways that they may not have in previous, higher-interest, periods.

Taken as a whole, the risks associated with a low interest rate future are, in my view, to the downside and will reasonably occupy the minds not just of monetary policymakers but also of financial sector decision-makers and regulators.

Lastly, as we've all seen, Congress has enacted major changes to the tax code. While it's extremely early, I think it's fair to suggest that these changes will likely provide some boost to output in the short run. In the longer run, say, three years out and beyond, I view them as unlikely to leave incomes more than 1 percent above the level they'd otherwise have reached. Let me elaborate briefly on why I hold this view. In the short run, like most economists, I believe that debt-financed tax cuts will have little effect on output and employment due to stronger demand, since the economy is already at or beyond full employment. As for the longer run, while there are provisions in the legislation that could boost aggregate supply by raising investment or (less likely) raising labor force participation in a sustained manner, my sense is that these supply effects are likely to be small in magnitude and will only be discernable — if at all — over a number of years.

Nonetheless, it is also true that it is early days indeed, so much more work examining the gory details of the legislation is needed to understand its effects. I therefore will be an avid consumer of research that attempts to provide reliable estimates of any changes in aggregate supply going forward. Until I see that evidence, my forecast is that the tax legislation will have limited impact, though it plausibly shifts the balance of risks in the direction of slightly higher output, employment and inflation over the coming few years.

I'll close on a longer-run note. While the United States is performing well, and seems poised to continue doing so in the coming year, the risks associated with a low interest rate environment are ones that I view as worth keeping in mind. That said, it is low productivity growth that makes these risks relevant to begin with. And it is this that is of greatest concern: Productivity growth determines, in the long run, the pace of improvement in our collective well-being.

And with that, I'm happy to take, and maybe even answer, some questions. Thank you.

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[1] I am grateful to Urvi Neelakantan, Jessie Romero, Roy Webb, and John Weinberg for assistance in preparing these remarks.

[2] For example, see Christina D. Romer and David H. Romer, "A New Measure of Monetary Shocks: Derivation and Implications," *American Economic Review*, September 2004, vol. 94, no. 4, pp. 1055-1084; and Romer and Romer, "What Ends Recessions?" NBER Macroeconomics Annual, 1994, vol. 9, pp.13-80.

[3] For example, see the Hornstein-Kudlyak-Lange Non-Employment Index (NEI) published by the Richmond Fed.

[4] For example, see Gilbert Cette, John G. Fernald, and Benoit Mojon, "The Pre-Great Recession Slowdown in Productivity," *European Economic Review*, April 2016, vol. 88, pp. 3-20.

[5] See Claudia Goldin and Lawrence F. Katz, *The Race Between Education and Technology*, Cambridge, Mass.: Harvard University Press, 2010.

[6] Robert Gordon, *The Rise and Fall of American Growth: The U.S. Standard of Living Since the Civil War*, Princeton, N.J.: Princeton University Press, 2016.

[7] See Thomas A. Lubik and Christian Matthes, "Calculating the Natural Rate of Interest: A Comparison of Two Alternative Approaches," Federal Reserve Bank of Richmond *Economic Brief* no. 15-10, October 2015.