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Assessing Maximum Employment

Remarks by

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Thank you, Francine, and thank you to the Central Bank of Iceland for the invitation to speak to you today.[1]

My subject is the Federal Reserve's mandate of maximum employment. In the Fed's monetary policymaking, maximum employment and stable prices are linked in the mandate assigned to the Federal Reserve by U.S. law, which we refer to as the dual mandate. Icelanders, I know, are a seafaring people, and those here will understand what I mean when I say that the dual mandate is our "lodestar," a word our two languages share. It is our goal and our guide in setting monetary policy.

There is an important distinction between our dual-mandate goals. For reasons that I will explain, while the Federal Open Market Committee (FOMC) has defined "stable prices" as 2 percent annual inflation, such numerical precision is not possible in defining maximum employment.

To achieve price stability, the Fed adopted a numerical target for inflation in 2012 that hasn't changed. It has remained unchanged because the Committee has repeatedly reaffirmed the judgment that it made in 2012 that 2 percent inflation is the rate most consistent with its statutory mandate. In contrast, the Federal Reserve has not spelled out a numerical goal for the unemployment rate or some other measure of employment because maximum employment can move up and down over time and is not directly measurable, and also because the different factors that determine it are either difficult or impossible to measure in real time.

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

Plan of the Talk

The unemployment rate is the statistic that the public most often uses to form views about labor market conditions, and it is also the statistic that economists most often use to try to infer maximum employment. And economists frequently refer to u* as the unemployment rate that corresponds to maximum employment. That said, in my speech today, I would like to offer historical examples of why u* varies over time and why it would be a mistake to assume that it is a fixed number.[2] Then, I will review the evolution of the unemployment rate over the past two decades and show that this rate has varied over time, moved by the interplay of myriad factors such as demographics, labor market regulations, changes in business or consumer confidence, or cyclical changes in aggregate demand and monetary policy shocks. In contrast, u* is moved mostly by either structural changes, such as skill deterioration or capital depreciation, or by long-run factors in the labor market, such as the demographic and skill composition of the population. As a result, u* does not move as much as the unemployment rate over time.[3] This is significant because monetary policy is aimed at managing the business cycle to minimize deviations from maximum employment.

[2] In fact, early on, economists have embarked to estimate the time-varying maximum employment in the economy. At least since Perry (1970), it was noted that u* can vary over time; see George L. Perry (1970), "Changing Labor Markets and Inflation," *Brookings Papers on Economic Activity,* no. 3, pp. 411–48, https://www.brookings.edu/wp-content/uploads/1970/12/1970c_bpea_perry_schultze_solow_gordon.pdf.

[3] Consistent with the view that u* moves less than the unemployment rate over time, in this speech, most of the models that I review assume that u* is the trend component of the unemployment rate. For an alternative view that challenges the weaker cyclicality of u* relative to the unemployment rate, see Robert E. Hall and Marianna Kudlyak (2023), "The Active Role of the Natural Rate of Unemployment," NBER Working Paper Series 31848 (Cambridge, Mass.: National Bureau of Economic Research, November; revised December 2024), https://www.nber.org/papers/w31848.

In reviewing the unemployment rate, I will also note that it certainly bears valuable information, but, in many cases, this needs to be complemented with other labor market indicators to have a fuller picture of the state of the economy.

As I have noted, maximum employment is not directly measurable. Likewise, we cannot observe u* directly, and it has to be inferred by statistical techniques, which I'll review.[4] One element common to all the approaches that I review is that they use a number of labor market indicators in addition to the unemployment rate in forming their estimates of maximum employment. Another element in common to some of the approaches is that they try to separate transient factors, or higher-frequency variation, from a more permanent, long-run feature of the economy that can be interpreted as u*.

Case Study: The Assumption of a Fixed Maximum Employment in the 1970s

A common assumption in the economics profession during the 1960s was that u* was 4 percent.[5]

While this number might have been a decent approximation of u* during that period, it did not consider the possibility of meaningful changes in that value and, specifically, changes due to the rapid growth in labor supply from the post–World War II baby boomers entering the workforce. Especially because younger workers have higher levels of unemployment, the advent of the baby boomers meant that u* in the 1970s was surely higher than 4 percent. The Federal Reserve was slow in revising its estimate of u*.

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[4] For some early examples of the use of advanced statistical techniques such as the application of Kalman filtering techniques, see, for instance, the early examples of Peter K. Clark (1987), "The Cyclical Component of U.S. Economic Activity," *Quarterly Journal of Economics,* vol. 102 (November), pp. 797–814; and Kenneth N. Kuttner (1994), "Estimating Potential Output as a Latent Variable," *Journal of Business & Economic Statistics,* vol. 12 (July), pp. 361–68. For a recent summary of the literature, see Alessandro Barbarino, Travis J. Berge, and Andrea Stella (2024), "The Stability and Economic Relevance of Output Gap Estimates," *Journal of Applied Econometrics,* vol. 39 (September/October), pp. 1065–81.

[5] See Arthur M. Okun (1962), "Potential GNP: Its Measurement and Significance," *Proceedings of the Business and Economics Statistics Section,* pp. 98–104.

The high unemployment rate and too low fixed estimate of u* minimum unemployment, in conjunction with the failure to recognize the slowdown in trend productivity, led the Federal Reserve to exaggerate the estimate of slack in the economy and maintain monetary policy that was too loose, adding to other factors driving persistently high inflation over that decade.[6] This experience led the Federal Reserve to recognize that a fixed 4 percent value for u* was a poor basis for understanding the cyclical position of the economy.

The experience of the 1960s and 1970s made it clear that demographic changes need to be considered in estimating u*—a topic I will explore further in my speech.

The U.S. Labor Market over the Past Two Decades

The U.S. labor market over the past two decades provides some valuable circumstantial evidence for how maximum employment can change over time. Let me start by discussing the Great Recession, which began in late 2007 and was driven by a severe financial crisis. In the months before the recession began, the unemployment rate reached a low of 4.4 percent and then peaked at 10 percent in October 2009. Although the unemployment rate is a useful metric of the severity of that event, an additional variable that reflects the depth and persistence of the downturn in the labor market after the Great Recession was the share of long-term unemployed—the percentage of unemployed people out of work for 27 weeks or more—which was nearly twice as high as during the deep recession of the 1980s. Longer spells of unemployment can generate persistence because the longer the duration of unemployment for workers, the more their skills erode and the harder it is to become reemployed, leading, in turn, to higher

[6] See Athanasios Orphanides (2003), "The Quest for Prosperity without Inflation," *Journal of Monetary Economics,* vol. 50 (April), pp. 633–63.

unemployment, a phenomenon known as hysteresis. While some have argued that only workers unemployed for shorter durations should be counted in estimating the slack in the economy, hysteresis is an important part of slack during periods with high unemployment.[7] Instead, the experience of the Great Recession reinforced the value of consulting other useful measures of slack.

After the Great Recession, it took eight years for the unemployment rate to reach the pre-recession low, but when it did, in 2016, it continued to fall, reaching 3.5 percent in 2019 and remaining close to this level until the beginning of the COVID-19 recession in 2020. One thing that was remarkable about this period was that this low level of unemployment occurred without any escalation of inflation. Personal consumption expenditures inflation ran well below an annual rate of 2 percent for almost all of the decade after the Great Recession, when monetary policy was highly accommodative. One could infer that u* had moved down over this period.

Turning to the pandemic recession, the unemployment rate rose to nearly 15 percent in two months, but a distinguishing feature of this increase was that a large fraction of the unemployed were temporarily laid off.[8] Economic research suggests that those who lose their jobs via temporary layoffs have a high likelihood of being recalled, with the latest estimates suggesting a 60 percent probability.[9] Considering this, it was not

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[7] See, for instance, Olivier J. Blanchard and Lawrence H. Summers (1987), "Hysteresis in Unemployment," *European Economic Review,* vol. 31 (February–March), pp. 288–95.

[8] In addition, the rise in temporary layoffs was considered by the Bureau of Labor Statistics to be understated, because many respondents to the Current Population Survey misreported their status as employed but not at work—that is, the properly measured unemployment rate would have risen by much more than was actually reported; see, for example, page 6 of the May 2020 Employment Situation report, which is available on the Bureau of Labor Statistics' website at https://www.bls.gov/news.release/archives/empsit_06052020.pdf.

[9] See the classic study of David M. Lilien (1980), "The Cyclical Pattern of Temporary Layoffs in United States Manufacturing," *Review of Economics and Statistics,* vol. 62 (February), pp. 24–31. For a more

surprising that the post-pandemic recovery was characterized by a fast decline in the unemployment rate.[10] In this sense, the unemployment rate alone was not a sufficient indicator of the true state of the labor market. In the post-pandemic recovery, the unemployment rate fell to 3.4 percent by April 2023. Again, for a second time we saw the unemployment rate falling to levels that were in the past associated with price pressures, whereas in this case inflation was also falling.

In summary, the past two recessions underscored that there are useful statistics beyond the unemployment rate that help inform a reading of maximum employment, and the past two recoveries suggest that the U.S. economy may sustain unemployment as low as 3.5 percent.

Turning to the current state of the labor market, the unemployment rate has risen only very slowly, and it has moved within a tight range of around 4.2 percent, which is its current reading. In addition, temporary layoffs are back at their pre-pandemic level, and vacancies and quits have leveled off. As a consequence, I judge the labor market to be stable. Most likely, the labor market is also close to maximum employment given that the estimates of u* from some of the models that I will consider in the rest of this speech are in the vicinity of 4.2 percent.

I have used some historical examples to illustrate how the unemployment rate has changed over time, and I have made some informal inference on the movements of u* in

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recent paper that makes use of matched employer–employee data, see Arash Nekoei and Andrea Weber (2015), "Recall Expectations and Duration Dependence," *American Economic Review,* vol. 105 (May), pp. 142–46.

[10] Moreover, academic research also suggests that the extent of firms' recourse to temporary layoffs is correlated with firms' expectations of near-term economic activity. This would have suggested in real time that a sharp rise in temporary layoffs was not as worrisome as a similar increase in permanent job losses. See Arash Nekoei and Andrea Weber (2020), "Seven Facts about Temporary Layoffs," CEPR Discussion Paper 14845 (London: Centre for Economic Policy Research, June 3), https://cepr.org/publications/dp14845.

certain periods. Now let me explore different ways of estimating maximum employment. I will cover three separate methods: a method that uses the demographic composition of the population; a definition that considers the unemployment rate in conjunction with inflation in order to get closer to a definition of u* consistent with stable prices; and, lastly, a definition that focuses on maximum employment that one can obtain by taking into account that workers take time to find jobs and firms take time to fill job openings. Some of the models that I review also consider the labor force participation rate, as structural variation in this rate also affects maximum employment. Historical experience with the different forces that can move around maximum employment indicates that all three of these approaches could be helpful in the future when trying to estimate maximum employment.[11]

Estimation of Maximum Employment Using Demographics

In describing the impact of the baby boomers on the labor market, I have already provided an example of how the demographic composition of the workforce may affect maximum employment. More generally, the age distribution in the population or educational attainment or skill distribution are always important factors in evaluating the potential workforce. Beyond the composition of the workforce, developments within specific demographic subgroups also may be relevant for maximum employment. For instance, the increase in labor force participation of women over the past 50 years has been an important factor that has augmented the available workforce. Granular data from

[11] Some studies distinguish long-run unemployment, which would fall in the first category of models that use demographic information, from stable price unemployment, which also adds a Phillips curve to the model. For a recent review, see Richard K. Crump, Christopher J. Nekarda, and Nicolas Petrosky-Nadeau (2020), "Unemployment Rate Benchmarks," Finance and Economics Discussion Series 2020-072 (Washington: Board of Governors of the Federal Reserve System, August), https://doi.org/10.17016/FEDS.2020.072.

the Labor Department's monthly survey of household employment known as the Current Population Survey, sometimes in conjunction with data on job openings and flows in and out of employment, can add demographic details to the estimation of maximum employment.

The models that exploit demographic data separate the trend or structural factors in both the unemployment rate and labor force participation rate from transient factors in individual demographic groups, allowing an estimate of maximum employment.[12] I think of this as a "bottom up" approach.[13]

One can add an additional layer of complexity in working with demographic groups. One important aspect of the unemployment rate is its characteristic countercyclical dynamics—that is, the way this rate increases at the onset of recessions due to an increase in the flow out of employment or layoffs, and its decline in expansions as more unemployed workers find jobs and flow into employment. In recognition of the importance of these flows, one alternative to extracting trends by demographic group is to extract trends in the flows by demographic groups and reconstruct u* dynamics from

[12] The resulting unemployment rate trend can be thought of as a "natural rate." The first reference to a "natural rate" of unemployment is from Milton Friedman in 1968. Friedman made it clear that he used the term to try and separate real forces from monetary forces, which are assumed to be more transient; therefore, it seems appropriate to use the term "natural rate" for estimates from demographic trends. See Milton Friedman (1968), "The Role of Monetary Policy," *American Economic Review,* vol. 58 (March), pp. 1–17. That said, such a concept is controversial; see Richard Rogerson (1997), "Theory Ahead of Language in the Economics of Unemployment," *Journal of Economic Perspectives,* vol. 11 (Winter), pp. 73–92.

[13] See, for instance, Stephanie Aaronson, Bruce Fallick, Andrew Figura, Jonathan Pingle, and William Wascher (2006), "The Recent Decline in the Labor Force Participation Rate and Its Implications for Potential Labor Supply," Brookings Papers on Economic Activity, pp. 69–154, https://www.brookings.edu/wp-content/uploads/2006/03/2006a_bpea_aaronson.pdf; Daniel Aaronson, Luojia Hu, Arian Seifoddini, and Daniel G. Sullivan (2015), "Changing Labor Force Composition and the Natural Rate of Unemployment," Chicago Fed Letter 338 (Chicago: Federal Reserve Bank of Chicago), https://www.chicagofed.org/publications/chicago-fed-letter/2015/338; Andreas Hornstein and Marianna Kudlyak (2019), "Aggregate Labor Force Participation and Unemployment and Demographic Trends," February 28, https://ssrn.com/abstract=3347310; and Didem Tüzemen (2019), "Job Polarization and the Natural Rate of Unemployment in the United States," *Economics Letters,* vol. 175 (February), pp. 97–100.

those flows. The implicit assumption is that the trend components of flows into and out of unemployment capture structural characteristics of the labor market, including market imperfections and the cost of job searches for both workers and employers.[14] The models in this class estimate a trend unemployment rate in the range between 4.1 and 4.3 percent in the fourth quarter of 2024. [15]

Estimation of Maximum Employment Consistent with Stable Prices

As I mentioned, the dual mandate includes stable prices. The models that I have just described do not contain information on prices. However, one may include price information by adding inflation as a measure of aggregate price pressures in order to come up with an estimate of maximum employment consistent with stable prices.[16] A higher unemployment rate signals more workers are available to work, indicating more slack. As more workers are employed, the economy is moving to a situation of fewer resources being available for additional output and most likely to more price pressures. Maximum employment consistent with stable prices ideally strikes a balance between additional workers being hired and additional increases in prices. I have alluded to this

[14] See, for instance, Mary C. Daly, Bart Hobijn, Ayşegül Şahin, and Robert G. Valletta (2012), "A Search and Matching Approach to Labor Markets: Did the Natural Rate of Unemployment Rise?" *Journal of Economic Perspectives,* vol. 26 (Summer), pp. 3–26.

[15] See Murat Tasci (2012), "The Ins and Outs of Unemployment in the Long Run: Unemployment Flows and the Natural Rate," Working Paper 12-24 (Cleveland: Federal Reserve Bank of Cleveland, November), https://www.clevelandfed.org/publications/working-paper/2012/wp-1224-the-ins-and-outs-of-unemployment-in-the-long-run-unemployment-flows-and-the-natural-rate. See also Richard K. Crump, Stefano Eusepi, Marc Giannoni, and Ayşegül Şahin (2019), "A Unified Approach to Measuring u*," BPEA Conference Drafts, March 7–8, https://www.brookings.edu/wp-content/uploads/2019/03/A-Unified-Approach-to-Measuring-u.pdf. Ahn adds unemployment duration in conjunction with flows to estimate u*; see Hie Joo Ahn (2023), "Duration Structure of Unemployment Hazards and the Trend Unemployment Rate," *Journal of Economic Dynamics and Control,* vol. 151 (June), 104664.

[16] Estimates that use prices are sometimes referred to as the non-accelerating inflation rate of unemployment, or NAIRU, although NAIRU is somewhat of a misnomer. In fact, the inflation process in the Great Moderation is not described well by an accelerationist Phillips curve but rather by a mean reverting process around a stable trend, conveniently proxied by long-run inflation expectations. In that case, it would be more accurate to talk about "NIRU," or non-inflationary rate of unemployment.

concept in an informal way when arguing that in the period after the Great Recession, u* may have moved down through 2019.

In practice, inflation information is folded into the model by adding a relationship between prices and the unemployment rate known as the Philips curve. There is a long tradition in extracting trend employment consistent with stable prices using a various labor market and output measures. I will draw upon that heritage and briefly describe a model that like the statistical methods that I have already reviewed also aims at estimating maximum employment by separating the unemployment rate from cyclical factors, but it does so by using numerous output and labor market indicators in conjunction with price information.[17] Output indicators include both gross domestic product and gross domestic income. Among labor market indicators, in addition to the unemployment rate, there are payrolls, the workweek, and labor force participation, which means that the model is not limited to just the unemployment rate in inferring trend unemployment. The purpose of using many indicators is the belief that all of them follow the same cycle, and that it is easier to identify and separate the cycle from trend using a large set of indicators. Coming back to the Phillips curve, I would note that models that estimate u* are somewhat sensitive to the specification of the Phillips curve. For instance, the model that I have just described has a u* estimate of about 5 percent in

[17] The estimate that I report are from a variant of the model in Charles A. Fleischman and John M. Roberts (2011), "From Many Series, One Cycle: Improved Estimates of the Business Cycle from a Multivariate Unobserved Components Model," Finance and Economics Discussion Series 2011-46 (Washington: Board of Governors of the Federal Reserve System, October), https://www.federalreserve.gov/pubs/feds/2011/201146/201146pap.pdf.

the fourth quarter of 2024, but alternative Phillips curve specifications may lower it below 5 percent.[18]

Estimation of the Efficient Level of Employment

A third, often less mentioned concept of full employment is the "efficient" level of unemployment. This concept starts with the idea that it is inefficient for society to have unemployed workers and job openings. Society as a whole would gain by matching those workers with those job openings in a productive way. Of course, it is impossible to instantaneously reduce unemployed workers and job openings to zero. Newly unemployed workers take time to find a job, and vacancies take time to fill as firms find and screen applicants with the right skills. The empirical relationship between the unemployment rate and the job openings rate is summarized by the Beveridge curve, a downward-sloping curve along which more unemployed workers are associated with fewer job openings. The Beveridge curve is a structural aspect of the labor market, and it is effectively a constraint on the relationship between the unemployment rate and the job openings rate. However, given the Beveridge curve, monetary policymakers can try to move the economy along the curve closer to a point at which the total number of vacancies plus unemployed is minimized. One can show that this happens somewhere in between the two, precisely around a value of the unemployment rate equal to the geometric average of the unemployment and vacancy rate.[19] The current estimate of this

[18] For instance, the Phillips curve could be non-linear as in Pierpaolo Benigno and Gauti B. Eggertsson (2023), "It's Baaack: The Surge in Inflation in the 2020s and the Return of the Non-Linear Phillips Curve," NBER Working Paper Series 31197 (Cambridge, Mass.: National Bureau of Economic Research, April), https://www.nber.org/papers/w31197.

[19] The efficient level of unemployment is also referred to as the "full employment rate of unemployment" or FERU; see Pascal Michaillat and Emmanuel Saez (2024), "$u^* = \sqrt{uv}$: The Full-Employment Rate of Unemployment in the United States," BPEA Conference Draft, September 26–27, https://www.brookings.edu/wp-content/uploads/2024/09/5_MichaillatSaez.pdf.

full employment concept places the unemployment rate at 4.2 percent in the fourth quarter of 2024.

Conclusion and Policy Message

I want to draw some conclusions from the points I have made today.

My discussion has touched upon many different statistics of the labor market, including the possibility of using data that exploits the heterogeneity of different demographic groups, which I judge to be very informative about u*. The reason is that different business cycles are generated by different shocks that affect the economy in different ways, so that useful indicators of slack in past cycles may not be as insightful in the future. For instance, when there is slack in the labor market, measures taking into account unemployment duration can be more informative about the persistence of unemployment and future slack. By contrast, when labor markets are tight, measures of flows into, out of, and across jobs will give a better measure of the job opportunities for workers and potential upward pressures on wages. Similarly, the vacancy and unemployment ratio combination used in the definition of efficient u* can provide an alternative measure of maximum employment.

Of course, any one of the estimation techniques that I have reviewed has limitations. For instance, there are constraints on the number of indicators that each model can process. This implies that some models will be better at capturing some drivers of maximum employment than others. That is why I cannot point to the best statistic or best model of maximum employment. I can only acknowledge that a rich set of models and indicators only benefits the policymaker. Given the uncertainty in estimating maximum employment in real time and the many options available, I consider

it undesirable to adopt one particular measure to guide monetary policy. This is something to bear in mind as I approach the current review of the FOMC's Statement on Longer-Run Goals and Monetary Policy Strategy, which we call our framework.