# Appendix A: CBO's Projections of Demographic and Economic Trends

The Congressional Budget Office develops its assessment of the long-term outlook for the federal budget on the basis of its projections of demographic and economic factors over the next three decades. The projections presented in this report are consistent with the economic projections for the 2020–2030 period that CBO published in July.[1] Those projections incorporate the budgetary and economic effects of the 2020 coronavirus pandemic and associated measures taken to limit in-person interaction. They also reflect the economic and budgetary impact of laws enacted to address the public health emergency and to support households, businesses, and state and local governments. (A set of annual projections is included in this report's supplemental data; they are available online at www.cbo.gov/publication/56516.)

## Demographic Factors

Changes in the size and composition of the U.S. population influence the growth of the economy and affect federal tax revenues and spending. Rates of fertility, net immigration, and mortality determine how the population evolves, and the relative contribution of each of those factors changes over time.

CBO expects the population to increase from 334 million people at the beginning of 2020 to 378 million in 2050. Although the population will increase over that period, population growth is expected to decline from an average rate of 0.5 percent per year over the next decade to an average rate of 0.3 percent per year in the last decade of the projection period.

The population is projected to become older, on average, throughout the projection period. In the agency's projections, the share of the population age 65 or older grows over the 30-year period, whereas the share that is of working age (ages 20 to 64) shrinks. As a result, the ratio of working-age people to people 65 or older falls from an

average of 3.1 to 1 over the first decade of the period to an average of 2.5 to 1 during the last decade.

CBO expects the population to be 2.8 percent smaller (equaling 11 million fewer people) in 2050 than the agency projected last year (see Figure A-1). Those changes result from revisions to the agency's projected rates of fertility, net immigration, and mortality.

### Fertility

CBO projects that the total fertility rate will remain at its most recent historical value of 1.7 children per woman in 2020 and decline to 1.6 children per woman in 2021 in response to the economic effects of the pandemic.[2] CBO expects the fertility rate to gradually rise through the remainder of the decade, averaging 1.8 children per woman from 2020 to 2030 and 1.9 children per woman in the following two decades.

**Projections of Fertility.** CBO projects fertility rates on the basis of the agency's assessment of historical fertility trends, the effects of the pandemic, and other factors. Though fertility rates tended to decline during recessions and rebound during recoveries in the two decades preceding the 2007–2009 recession, the fertility rate did not recover after that recession. That rate was 2.0 children per woman, on average, in the 20 years before the recession, peaking at 2.1 in 2007. The rate was 1.7 children per woman in 2019 (the most recent year for which data are available). The decline was largely attributable to lower fertility rates among women age 24 or younger.[3]

CBO projects the fertility rate to average 1.9 births per woman from 2020 to 2050, which is below the replacement rate—the fertility rate required for a generation to

---

1.  See Congressional Budget Office, *An Update to the Economic Outlook: 2020 to 2030* (July 2020), www.cbo.gov/publication/56442.
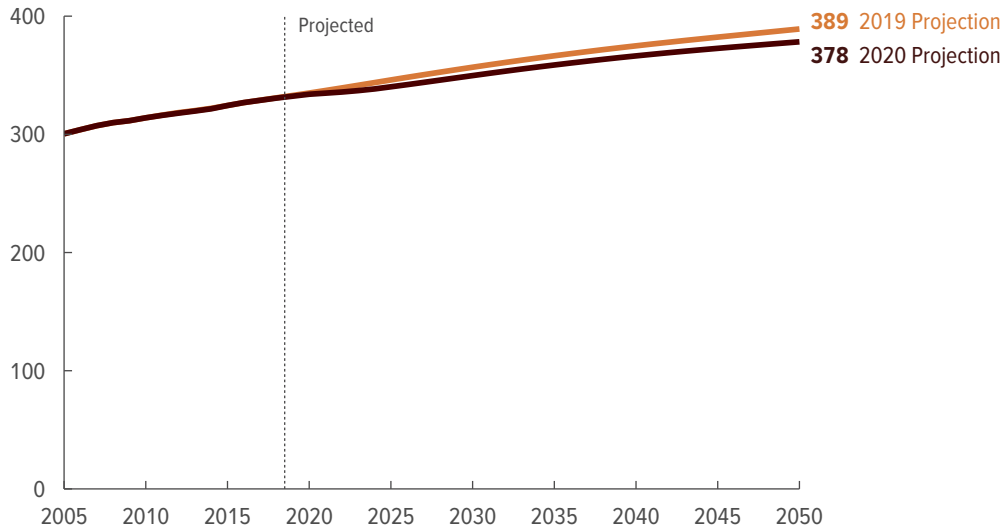
2.  The total fertility rate represents the average number of children that a woman would have in her lifetime.

3.  See Brady E. Hamilton and others, *Births: Provisional Data for 2019,* Vital Statistics Rapid Release Report 8 (National Center for Health Statistics, May 2020), www.cdc.gov/nchs/data/vsrr/vsrr-8-508.pdf (372 KB).

**Figure A-1.**

## CBO's 2019 and 2020 Projections of Population

Millions of People



In 2020, CBO projects fertility rates to be lower, mortality rates to be higher, and rates of net immigration to be lower than it did last year. As a result, the United States is now projected to have 11 million fewer people in in 2050 than CBO projected last year.

Source: Congressional Budget Office.

Actual data are shown through calendar year 2018, the most recent year for which such data are available.

exactly replace itself—of 2.1 children per woman. CBO's projections of fertility rates are consistent with the recommendation made to the Social Security Advisory Board by its 2019 Technical Panel on Assumptions and Methods.[4]

**Changes in Projections of Fertility Since Last Year.**
CBO's current projection of the total fertility rate is lower, on average, than the agency previously projected for the 2020–2030 decade and is unchanged from previous projections for 2031 to 2050. In response to the recession brought on by the pandemic, the projected rate of the economic recovery, and a lower-than-expected total fertility rate in 2019, CBO now projects that the fertility rate will be 1.7 births per woman in 2020, 1.6 births per woman in 2021, and 1.9 births per woman by 2028. In contrast, last year CBO projected the fertility rate to be slightly less than 1.9 births per woman in 2020 and to rise to 1.9 births per woman by 2022.

---

4.   In the 2019 Technical Panel on Assumptions and Methods, the Social Security Advisory Board recommended reducing the total fertility rate from 2.0 to 1.95 in the long run. For details, see Supplement to 2019 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (September 2019), p. 9, https://go.usa.gov/xfyAy (PDF, 597 KB).

CBO currently projects 2.8 million fewer births over the first half of the projection period than it did last year. That projected reduction in births lowers the projected number of working-age and childbearing-age people in the second half of the projection period and lowers the projected number of births over that period. Over the second half of the projection period, CBO currently projects a total of 1.6 million fewer births and an average of 5.4 million fewer working-age people per year.

## Immigration

Under current law, CBO projects that annual net immigration to the United States (a measure that accounts for all people who either enter or leave the United States in any year) rises to from 0.9 million people, on average, in the first decade of the projection period to 1.1 million people, on average, in the third decade of the period.

**Projections of Immigration.** CBO projects immigration rates in three categories: lawful permanent residents (LPRs), legal temporary residents (LTRs), and foreign-born people without legal status. Over the first two decades of the projection period, CBO projects net flows for each category by using a detailed modeling approach that is based on the agency's economic projections and assessment of recent trends. In the last decade,

in CBO's projections, net immigration grows each year at a rate equal to overall population growth in the previous year (0.3 percent per year on average).

In 2020, immigration is projected to fall because of travel restrictions and reduced visa-processing capabilities related to the pandemic. Between 2021 and 2040, immigration is projected to increase as the effects of the pandemic ease and economic conditions are once again an important predictor of net flows of foreign-born people without legal status. The annual net flow of LPRs is projected to increase from 790,000 people per year, on average, in the first decade to 850,000 per year in the second decade. The annual net flow of LTRs is projected to average 60,000 people per year in the first decade and 80,000 people per year in the second decade. The net flow of foreign-born people without legal status is projected to be 10,000 people per year, on average, in the first decade of the projection period, rising to 130,000 people per year, on average, in the second decade of the period.

**Changes in Projections of Immigration Since Last Year.** CBO's current projection of net immigration is less than its projection in 2019. The agency projects an average net immigration rate of 2.8 immigrants per 1,000 people between 2020 and 2050, compared with its projection of 3.1 immigrants per 1,000 people through the projection period in last year's report.

In CBO's projections, 2.5 million (or 21.0 percent) fewer people, on net, immigrate in the first decade of the projection period than the agency projected last year. That reduction occurs in part because of travel restrictions and reduced visa-processing capabilities related to the pandemic and includes 0.8 million fewer LPRs, 0.3 million fewer LTRs, and 1.4 million fewer foreign-born people without legal status than the agency projected last year.

In the second decade of the projection period, CBO projects lower net flows of foreign-born people without legal status and LPRs than it did last year. In response to data that show weak net flows of foreign-born people without legal status in recent years, CBO projects fewer immigrants from this category. Additionally, because net flows of LPRs in the second decade grow with population, reductions to net flows of LPRs in the first decade result in fewer immigrants from this category in the second decade. As a result of those changes, there are a

total of 840,000 (or 7.4 percent) fewer immigrants, on net, between 2031 and 2040.

In the third decade of the projection period, CBO's projections of net immigration flows are based on overall population growth in the previous year. The agency's projection of lower net immigration before 2040 thus reduces its projections of immigration flows after that date. Additionally, in CBO's current projections, numerical limits on certain categories of LPRs do not increase as the population grows. As a result of that change and of CBO's reduced projection of population growth, total net immigration is projected to grow at an average annualized rate of 0.2 percent between 2041 and 2050, compared with 0.4 percent in last year's projections. In total, CBO projects approximately 1 million (or 8.5 percent) fewer people to immigrate, on net, over the 2041–2050 period than the agency projected last year.

**Mortality**
CBO projects that mortality rates, which represent the annual number of deaths per thousand people, decline over the projection period. As a result, life expectancy at birth is projected to increase from its average of 79.0 years from 2020 to 2030 to 81.6 years, on average, from 2041 to 2050. Similarly, life expectancy at age 65 is projected to rise from an average of 19.7 years in the first decade of the projection period to an average of 21.3 years in the third decade.

**Projections of Mortality.** CBO projects mortality rates on the basis of its assessment of historical trends in mortality and the effects of the pandemic. The mortality rate has generally declined in the United States since the early 20th century, although the rate of that decline has slowed over time and even reversed in recent years. For the most part, mortality rates have decreased more quickly for younger people than for older people during the past century. However, mortality rates rose in recent years, particularly among people ages 15 to 44. The result was that life expectancy at birth also declined, marking the first decreases in that metric since 1993. Those decreases are primarily driven by increases in mortality from Alzheimer's disease, suicide, and drug overdoses (particularly opioids).[5]

---

5.  For an account of how factors affecting mortality and mortality improvement rates have changed over time, see National Center for Health Statistics, *Health, United States, 2018* (NCHS, 2019), www.cdc.gov/nchs/data/hus/hus18.pdf (1.6 MB).

Through 2021, CBO initially projects mortality rates to decrease at roughly the same average rate as in the previous decade (2008 to 2017). The agency then adjusts those initial projections to account for the additional deaths associated with the pandemic. Additional deaths include fatalities directly attributable to the coronavirus as well as increased fatalities attributable to heart disease, diabetes, pneumonia, and other respiratory illnesses. Additional deaths from causes other than the coronavirus may result from individuals delaying or not seeking treatment during the pandemic, or they may be directly attributable to the coronavirus but misclassified because of other underlying conditions. The increased number of additional deaths is partially offset by a decrease in the number of accidental deaths. For the remainder of the projection period, the agency expects a return to longer-run trends in mortality improvement, with mortality rates for each age group generally declining at the average pace experienced between 1950 and 2017.

After projecting average mortality rates for men and women in each age group, CBO incorporates differences in those rates for people age 30 or older on the basis of marital status, education, disability-insurance status, and lifetime household earnings (for people younger than 30, the mortality projections account for age and sex only). CBO projects lower mortality rates and longer life expectancy for people who are married, have more education, do not receive benefits through the Social Security Disability Insurance program, or are high earners.[6]

**Changes in Projections of Mortality Since Last Year.** CBO currently projects a higher mortality rate for all age groups in the near term and a lower rate of mortality improvement over the next three decades than it did last year. As a result, CBO projects 1.4 million (or 1.2 percent) more deaths over the next three decades than it projected last year. Higher mortality rates also contribute to shorter life expectancies than the agency projected last year.

---

6.  For more information about mortality differences among groups with different earnings, see Tiffany Bosley, Michael Morris, and Karen Glenn, *Mortality by Career-Average Earnings Level*, Actuarial Study 124 (Social Security Administration, April 2018), https://go.usa.gov/xGcme (PDF, 301KB); Congressional Budget Office, *Growing Disparities in Life Expectancy* (April 2008), www.cbo.gov/publication/41681; and Julian P. Cristia, *The Empirical Relationship Between Lifetime Earnings and Mortality*, Working Paper 2007-11 (Congressional Budget Office, August 2007), www.cbo.gov/publication/19096.

To reflect recent trends, CBO currently projects that mortality rates for working-age adults decline in the near term at a slower rate than the agency previously projected. For most people age 55 or older, CBO then revises those projections upward for 2020 and 2021 to reflect the greater number of fatalities from the pandemic in that age group. After 2021, CBO expects mortality rates to decline at roughly the average rate each age group experienced between 1950 and 2017. That rate of mortality improvement is generally lower than CBO projected last year because of the incorporation of two additional years of higher-than-expected mortality rates.

CBO's projections of mortality rates affect the agency's projections of life expectancy. Compared with last year's projections, mortality rates are declining more slowly for people age 65 or younger (especially for those younger than age 45). As a result, life expectancy at birth is projected to be 82.0 years in 2050, whereas CBO projected last year that it would be 82.6 years. Life expectancy at age 65 is projected to be 21.6 years in 2050, unchanged from last year's projection.

## Contributions of Demographic Factors to Population Growth

The combination of the three demographic factors described above—fertility, immigration, and mortality—determine CBO's projections of total population growth. Over the course of the next decade, immigration accounts for about half of the overall increase in the size of the population, and changes in fertility and mortality account for the other half (see Table A-1). With fertility rates expected to remain below the replacement rate, immigration becomes an increasingly important part of overall population growth in the United States. By 2050, in CBO's projections, nearly all of the nation's population growth is driven by net immigration (see Figure A-2).

## Economic Factors

The federal government's revenues, spending, and debt depend on economic factors such as the growth of gross domestic product (GDP), the size and composition of the labor force, the number of hours worked, the distribution of earnings among workers, capital accumulation, productivity, inflation, and interest rates. CBO's projections of those factors reflect the agency's assessment of various economic and demographic developments, as well as the effects of fiscal policy on economic activity.

**Table A-1.**

## Average Annual Values for Demographic Variables That Underlie CBO's Extended Baseline Projections

|  | 1990–2019 | 2020–2030 | 2031–2040 | 2041–2050 | Overall, 2020–2050 |
|---|---|---|---|---|---|
| Growth of Population (Percent) | 0.9 | 0.5 | 0.5 | 0.3 | 0.4 |
| Growth of Population Ages 20 to 64 (Percent) | 0.9 | 0.1 | 0.2 | 0.2 | 0.2 |
| Growth of Population Age 65 or Older (Percent) | 1.8 | 2.7 | 1.0 | 0.5 | 1.4 |
| Contribution to Population Growth (Percentage points) |  |  |  |  |  |
| Births | 1.4 | 1.2 | 1.2 | 1.1 | 1.2 |
| Deaths | -0.9 | -1.0 | -1.0 | -1.1 | -1.0 |
| Net immigration | 0.4 | 0.2 | 0.3 | 0.3 | 0.3 |
| Growth of Civilian Noninstitutionalized Population (Percent)[a] | 1.1 | 0.6 | 0.4 | 0.4 | 0.5 |
| **Memorandum**: |  |  |  |  |  |
| Fertility Rate (Children per woman) | 2.0 | 1.8 | 1.9 | 1.9 | 1.9 |
| Life Expectancy at Birth, End of Period (Years)[b] | 78.6 | 79.8 | 81.0 | 82.0 | 82.0 |
| Life Expectancy at Age 65, End of Period (Years)[b] | 19.4 | 20.2 | 20.9 | 21.6 | 21.6 |
| Immigration Rate (Per 1,000 people in the U.S. population) | 3.8 | 2.5 | 2.9 | 2.9 | 2.8 |

Source: Congressional Budget Office.

The extended baseline projections, which generally reflect current law, follow CBO's 10-year baseline budget projections and then extend most of the concepts underlying those projections for the rest of the long-term projection period.

a. The civilian noninstitutionalized population includes individuals age 16 or older who are not inmates of institutions or on active duty in the armed forces.

b. Life expectancy as used here is period life expectancy, which is the amount of time that a person in a given year would expect to survive beyond his or her current age on the basis of that year's mortality rates for various ages.

## Gross Domestic Product

CBO expects real (inflation-adjusted) GDP to grow 1.6 percent per year, on average, over the 2020–2050 period (see Table A-2). That is 0.9 percentage points less than the average growth of 2.5 percent for the past three decades and 0.3 percentage points less than CBO projected last year for the 2019–2049 period. CBO expects growth in real GDP per person to average 1.1 percent over the next three decades, 0.4 percentage points less than the average growth of 1.5 percent over the past three decades and 0.2 percentage points less than CBO projected last year for 2019 to 2049.

**Projections of GDP.** In CBO's projections, the average annual growth of real GDP slows from slightly more than 1.6 percent in the first decade of the projection period to slightly less than 1.6 percent in the second decade and just over 1.5 percent in the third decade. The deceleration in growth in the second decade occurs because the potential labor force—the share of the civilian noninstitutionalized population age 16 or older that
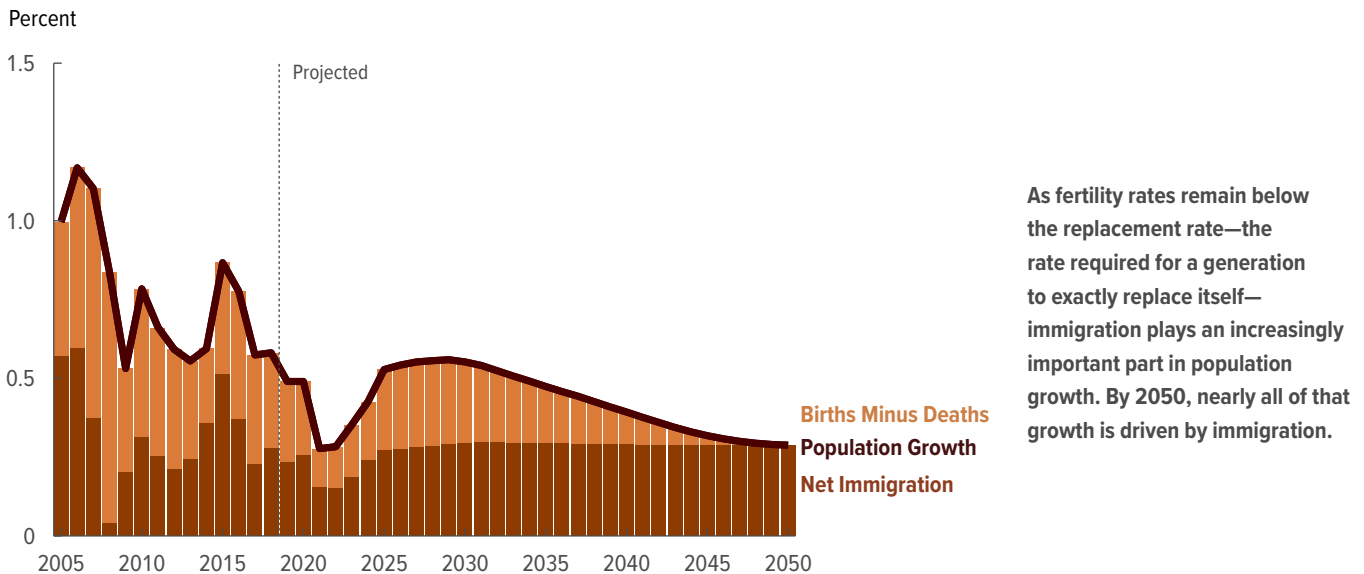
would be working or seeking work if the economy were at full employment—is expected to grow more slowly than in the first decade.[7] In the third decade, however, the deceleration arises from slower growth in two areas: total factor productivity (TFP) in the nonfarm business sector, and capital accumulation.

CBO's long-term projections of GDP reflect the agency's projections of potential (maximum sustainable) output. In CBO's forecasts, the growth rate of actual output typically converges with the growth rate of potential output in the second half of the first decade, and actual output stays about 0.5 percent below potential output. That persistent gap between actual output and potential output reflects the agency's assessment that actual output falls short of potential output to a greater extent and for longer periods during and after economic downturns

---

7. The civilian noninstitutionalized population includes individuals age 16 or older who are not inmates of institutions or on active duty in the armed forces.

**Figure A-2.**

## Demographic Factors That Contribute to Population Growth

Percent



As fertility rates remain below the replacement rate—the rate required for a generation to exactly replace itself—immigration plays an increasingly important part in population growth. By 2050, nearly all of that growth is driven by immigration.

**Births Minus Deaths**
**Population Growth**
**Net Immigration**

Sources: Congressional Budget Office; Social Security Administration.

Net immigration is a measure of all people who either enter or leave the United States in any year.

---

than actual output exceeds potential output during economic booms.[8]

In CBO's projections, real GDP drops significantly below real potential GDP in 2020 because of the recession caused by the pandemic. In the current forecast, the economy recovers from the recession and achieves its previous peak of real GDP by the middle of 2022. Even then, however, actual output is well below its potential. As a result, over most of the first decade of the projection period, actual output grows more quickly than potential output until it returns to its long-run relationship with potential output near the end of the decade. In the rest of the 30-year projection period, the growth rates of both actual and potential GDP reflect projected increases in the supply of labor, capital services, and productivity.

Real GDP per person is expected to increase at a slower pace than in the past—at an average annual rate of 1.1 percent over the 2020–2050 period, compared with 1.5 percent for the past 30 years. That slower increase occurs mainly because the labor force is projected to grow less rapidly than the population.

**Changes in Projections of GDP Since Last Year.** Real GDP is projected to grow at an average annual rate that is nearly a quarter of a percentage point lower over the 2019–2049 period than was projected in June 2019. In CBO's current projections, real GDP is 1.3 percent lower in 2029 and 6.7 percent lower in 2049 than the agency projected last year. In the first decade, real GDP grows more slowly than it did in last year's projection, primarily because of the recession caused by the pandemic. GDP is also projected to grow more slowly in the second and third decades of the period (2031 to 2050); however, in those years that slower growth occurs mainly because of slower growth in capital services than projected last year.

Slower growth in capital services arises from several changes in CBO's projections. The agency projects larger federal budget deficits in the second and third decades than it did last year, which reduce the funding available for investment and ultimately decrease the growth of

---

8.   A recent study explains the existence of a persistent output gap by examining asymmetric fluctuations in the unemployment rate around its long-term trend. See Stéphane Dupraz, Emi Nakamura, and Jón Steinsson, *A Plucking Model of Business Cycles,* Working Paper 748 (Banque de France, January 2020), https://tinyurl.com/y32ezhm4. For an assessment of the persistent output gap, see Congressional Budget Office, *Why CBO Projects That Actual Output Will Be Below Potential Output on Average* (February 2015), www.cbo.gov/publication/49890.

**Table A-2.**

## Average Annual Values for Economic Variables That Underlie CBO's Extended Baseline Projections

Percent

|  | 1990–2019 | 2020–2030 | 2031–2040 | 2041–2050 | Overall, 2020–2050 |
|---|---|---|---|---|---|
| **Growth of GDP** | | | | | |
| Real GDP[a] | 2.5 | 1.6 | 1.6 | 1.5 | 1.6 |
| Real potential GDP[b] | 2.4 | 1.8 | 1.6 | 1.5 | 1.6 |
| Potential labor force | 0.9 | 0.4 | 0.2 | 0.3 | 0.3 |
| Potential labor force productivity | 1.5 | 1.4 | 1.3 | 1.2 | 1.3 |
| Nominal GDP (Fiscal year) | 4.6 | 3.4 | 3.6 | 3.5 | 3.5 |
| Real GDP per person | 1.5 | 1.1 | 1.1 | 1.2 | 1.1 |
| **Growth of the Labor Force** | 0.9 | 0.3 | 0.2 | 0.3 | 0.3 |
| **Labor Force Participation Rate** | 65.4 | 61.3 | 60.2 | 59.6 | 60.4 |
| **Unemployment** | | | | | |
| Unemployment rate | 5.8 | 6.1 | 4.2 | 4.0 | 4.8 |
| Natural rate of unemployment | 5.0 | 4.3 | 4.0 | 3.8 | 4.0 |
| **Growth of Average Hours Worked** | -0.1 | * | * | * | * |
| **Growth of Total Hours Worked** | 0.9 | 0.2 | 0.3 | 0.3 | 0.3 |
| **Earnings as a Share of Compensation** | 81 | 81 | 80 | 80 | 80 |
| **Growth of Real Earnings per Worker** | 1.1 | 1.2 | 1.0 | 0.8 | 1.0 |
| **Share of Earnings Below the Taxable Maximum** | 85 | 83 | 82 | 81 | 82 |
| **Growth of Productivity** | | | | | |
| Total factor productivity in the nonfarm business sector | 1.3 | 1.0 | 1.1 | 1.1 | 1.1 |
| Real GDP per hour worked | 1.6 | 1.4 | 1.3 | 1.2 | 1.3 |
| **Inflation** | | | | | |
| Growth of the CPI-U | 2.4 | 2.0 | 2.2 | 2.2 | 2.1 |
| Growth of the GDP price index | 2.0 | 1.8 | 2.0 | 2.0 | 1.9 |
| **Interest Rates** | | | | | |
| Real rates | | | | | |
| On 10-year Treasury notes and the OASDI trust funds | 2.1 | * | 1.4 | 2.2 | 1.1 |
| Nominal rates | | | | | |
| On 10-year Treasury notes and the OASDI trust funds | 4.5 | 2.0 | 3.6 | 4.4 | 3.3 |
| On all federal debt held by the public[c] | 4.6 | 1.5 | 3.2 | 4.1 | 2.9 |

Source: Congressional Budget Office.

The extended baseline projections, which generally reflect current law, follow CBO's 10-year baseline budget projections and then extend most of the concepts underlying those projections for the rest of the long-term projection period.

CPI-U = consumer price index for all urban consumers; GDP = gross domestic product; OASDI = Old-Age, Survivors, and Disability Insurance; * = between -0.05 percent and 0.05 percent.

a. Real values are nominal values that have been adjusted to remove the effects of changes in prices.

b. Real potential GDP is the maximum sustainable output of the economy, adjusted to remove the effects of inflation. The two contributing factors to real potential GDP growth are growth in the potential labor force and growth in potential labor force productivity. The potential labor force is the labor force (that is, the civilian noninstitutionalized population that is age 16 or older and is either working or actively seeking work), adjusted to remove the effects of fluctuations in the business cycle. Growth in potential labor force productivity is the growth of the ratio of real potential GDP to the potential labor force, or the growth in real potential GDP that is not explained by growth in the potential labor force.

c. The interest rate on all federal debt held by the public equals net interest payments in the current fiscal year divided by debt held by the public at the end of the previous fiscal year.

capital. In addition, CBO has reduced its projection of labor force growth, reducing the need for investment to provide workers with capital. Finally, the agency now accounts for the effects of slower population growth and fewer new households on private investment in residential housing, resulting in slower growth of residential capital.

CBO's current projections also include its central estimate—the middle of a range of possible outcomes—of the effect of climate change on economic growth. In the agency's assessment, that effect slightly decreases growth in real GDP, reducing the level of real GDP by 1.0 percent by 2050, compared with what growth would have been if climate conditions were the same in 2050 as they were at the end of the 20th century. About 0.4 percentage points of that effect was incorporated in CBO's previous projections, so the agency has adjusted TFP growth in nonfarm business in this year's projection to reduce the level of real GDP in 2050 by an additional 0.6 percentage points.[9]

### Labor Force Participation and Labor Force Growth

The size of the labor force depends on the rates at which people in different demographic groups participate in the labor market. Since the mid-2000s, the overall labor force participation rate in the United States has declined substantially, predominantly because of the aging of the population.[10] CBO expects that decline to continue over the next couple of decades before it levels off toward the end of the 30-year projection period. Because a falling participation rate lessens the effect of population growth on the growth of the labor force, the labor force is expected to grow even more slowly than the population over the projection period, at an average rate of 0.3 percent per year from 2020 to 2050. CBO's current projections of labor force participation are significantly lower than last year's for the 2020–2025 period, reflecting the effects of the pandemic and the subsequent recession and recovery. Relative to the agency's previous projection, CBO projects slightly lower labor force participation, on average, after 2025; slower growth in the labor force over

---

9.  See Evan Herrnstadt and Terry Dinan, *CBO's Projection of the Effect of Climate Change on U.S. Economic Output*, Working Paper 2020-06 (September 2020), www.cbo.gov/publication/56505.

10. The labor force participation rate is the share of the civilian noninstitutionalized population age 16 or older that is working or actively seeking work.

the second and third decades; and a smaller labor force throughout the projection period.

**Projections of Labor Force Participation.** In CBO's projections, the rate of labor force participation falls from 63.1 percent in 2019 to 61.8 percent in 2020, reflecting the effects of the pandemic and economic crisis. The labor force participation rate continues to decline to 60.7 percent in 2030 and to 59.9 percent in 2040, primarily because of the aging of the population. After 2040, as demographic shifts slow, the participation rate also gradually stabilizes, averaging 59.6 percent in the third decade of the projection period.

The heightened health risks from the pandemic and the social-distancing measures taken to slow the spread of disease precipitated a sudden drop in economic activity and caused the labor force participation rate to fall by more than 3 percentage points in March and April this year—an unprecedented decline since the current system of monthly data collection began in 1948. The labor force participation rate has since rebounded, but only partially. The decline in the rate of labor force participation is partly the result of some people leaving the labor force or postponing job searches because of factors such as illness, health risks, and school closures. CBO projects that those factors will diminish in the remainder of 2020. As a result, the agency expects the overall labor force participation rate to continue to recover throughout the rest of the year. But that recovery is projected to stall after 2020 as downward pressure from the aging population offsets upward momentum from the economic recovery. In particular, CBO projects the labor force participation rate to decline after 2021, even as the gap from its potential continues to diminish.

In CBO's projections, the aging of the population accounts for most of the decline in the overall labor force participation rate over the next 30 years. People age 65 or older tend to participate in the labor force at lower rates than younger people—in 2019, the average participation rate for people ages 25 to 54 was 82.5 percent, and the rate for people age 65 or older was about 20 percent. Among the civilian noninstitutionalized population age 16 or older, the share of people age 65 or older increased from 16.3 percent in 2010 to 20.9 percent in 2020, and is projected to rise to 27.3 percent by 2050. At the same time, the share of the population ages 25 to 54 is expected to decline from 48.4 percent of the total population in 2020 to 44.5 percent by 2050. Were

it not for the aging of the population, the overall rate of labor force participation over the coming decades would be higher and more stable than currently projected, in CBO's assessment.

Aside from the aging population, CBO expects the effects of other demographic trends, economic trends, and current fiscal policies on labor force participation to largely offset one another in future decades. In particular, two long-run trends are expected to put downward pressure on the participation rate:

- Members of each generation that follows the baby boomers (particularly men) tend to participate in the labor force at lower rates than their predecessors did at the same ages. (One notable exception in later generations is that the share of women age 34 or younger who work is higher than it was for baby-boomer women at the same ages. However, as those later generations of women have aged, their participation rates have also fallen below those of their predecessors.)

- The marriage rate is projected to continue to fall, and unmarried men tend to participate in the labor force at lower rates than married men.

CBO expects those forces to be mostly offset by two trends that it projects will increase participation in the labor force:

- The population is becoming more educated, and people with more education tend to participate in the labor force at higher rates than do people with less education.

- Increasing longevity is expected to lead people to continue working to increasingly older ages.

In addition to the effects of those demographic trends, budgetary effects and incentives under current tax law, combined with economic trends, also affect the labor force. For example, growing federal deficits are projected to slow growth in the stock of private capital and to limit the growth of wages, thereby reducing the supply of labor. In addition, as people's income rises faster than inflation, more of their income is pushed into higher tax brackets through a process known as bracket creep, raising their effective tax rates. Higher tax rates and bracket creep are projected to decrease participation in the labor

force because individuals would earn less return on their labor.

**Changes in Projections of Labor Force Participation Since Last Year.** CBO's current projection of the overall labor force participation rate is significantly lower than it previously projected for 2020 to 2025 and slightly lower, on average, than the agency projected for 2026 to 2049. The agency lowered its projection of the labor force participation rate in the near term because of the effects of the pandemic. In addition, many workers near retirement might choose to retire early because of the pandemic. The drop in participation over the next five years is projected to be slightly offset by data showing more labor force participation than CBO projected in 2019.

CBO lowered its projection of the labor force participation rate after 2025, primarily reflecting revisions in the demographic composition of the population over the medium and long term. This year's projections of lower fertility rates, increased mortality rates for the working-age population, and a reduced net inflow of immigrants (who tend to be young or of working age) mean that the overall population will have a greater share of older people than previously projected. That, in turn, results in a reduced projection of the overall labor force participation rate.

**Projections of Labor Force Growth.** The pandemic is projected to cause the labor force to shrink by nearly 2 percent by the end of 2020; after that, growth is projected to pick up slightly as the economy continues to recover and population growth increases from its 2020 trough. However, the long-run decline in labor force participation means that less of the population's growth translates into labor force growth. For the 2020–2050 period, the number of people age 16 or older is expected to grow by 0.5 percent per year, on average, and the labor force is projected to grow at an average rate of 0.4 percent per year after 2020. That represents a significant slowdown from earlier periods: For example, the average annual growth rate in the labor force was 1.2 percent during the 1990–2006 period and 0.7 percent during the 2010–2019 period.

**Changes in Projections of Labor Force Growth Since Last Year.** CBO's current projection of labor force growth is slightly higher than its previous projection for most of the first decade of the 30-year projection period,

reflecting a catch-up in economic growth during the recovery from the pandemic and recession. Labor force growth is projected to be lower in the second and third decades of the projection period than CBO projected last year, largely because the population is expected to grow more slowly.

**Other Labor Market Outcomes**
In addition to the rate of labor force participation and the size of the labor force, CBO's long-term labor market outlook includes projections of the unemployment rate, the average and total number of hours that people work, and various measures of workers' earnings over the next 30 years. The agency regularly updates those projections to incorporate revisions in historical data, reassessments of economic and demographic trends, and changes to the agency's methodology.

**Unemployment.** After surging to 14.7 percent in April 2020, the unemployment rate for the civilian noninstitutionalized population age 16 or older fell to 8.4 percent in August 2020, when this report was written. In CBO's projections, the unemployment rate averages 10.6 percent in 2020, about 6.2 percentage points higher than the underlying long-run trend of unemployment. As the economy continues to recover from the recession, the unemployment rate is projected to continue to fall and eventually approach that underlying long-run trend. From 2028 on, the unemployment rate is expected to remain roughly one-quarter of one percentage point above that underlying long-run trend, a difference that is consistent with both the historical average relationship between the two measures and the projected gap of one-half of one percent between actual and potential GDP.

CBO projects the long-run trend of unemployment to decline gradually over the next three decades, from 4.4 percent in 2020 to 4.1 percent in 2030 and 3.7 percent in 2050, as the labor force ages and becomes increasingly educated. (Older and more educated workers tend to have lower rates of unemployment.) As the long-run trend declines, the actual unemployment rate is also projected to decline. By 2050, the long-run trend of unemployment is projected to reach 3.7 percent, and the actual rate is projected to reach 4.0 percent.

**Average Hours Worked.** Workers tend to work a different number of hours depending on their industry: For example, those in manufacturing work more than

40 hours per week, on average, whereas those in service industries work about 32 hours per week. As the share of workers employed in manufacturing has decreased and the share employed in service industries has increased over the past several decades, the average number of hours worked per week has declined for the economy as a whole. During the past decade, the shares of workers in the manufacturing and service industries have been largely stable. In CBO's assessment, future changes in the employment shares of different industries are unlikely to have substantial effects on the economywide number of average hours worked.

CBO projects that incentives under current tax law will influence the average number of hours worked. Higher tax rates on individual income take effect when certain provisions of the 2017 tax act expire at the end of 2025 under current law, which slightly reduces the average number of hours worked beginning in 2026. In addition, CBO expects effective tax rates on individual income rise because of bracket creep. Given economic trends and current law, CBO expects the average number of hours worked to decline slightly over the next 30 years. By 2050, CBO expects the average worker to work about 0.6 percent fewer hours per week than he or she does today.

**Total Hours Worked.** On the basis of projections of the size of the labor force, average hours worked, and unemployment, CBO estimates that total hours worked increase at an average annual rate of 0.3 percent between 2020 and 2050. That is less than the average annual increase of 0.9 percent in total hours worked over the past three decades. The deceleration in the growth of total hours is mainly because the population is expected to grow more slowly in the future than it has over the past 30 years.

In CBO's projections, the average growth in total hours worked is 0.2 percent in the first decade, 0.3 percent in the second decade, and 0.4 percent in the third decade. Growth in total hours worked increases in the second and third decades because of a falling unemployment rate. It also increases in the third decade because the rate of labor force participation stops decreasing by 2046 and begins to increase in 2047.

**Earnings as a Share of Compensation.** Workers' total compensation consists of taxable earnings and nontaxable benefits such as employers' contributions to

health insurance and pensions. Over the years, the share of total compensation paid in the form of wages and salaries has declined—from 91 percent in 1960 to 81 percent in 2019—mainly because the cost of health insurance has risen more quickly than total compensation.[11] Because CBO expects that trend in health care costs to continue, the portion of total compensation that workers receive as earnings declines to 80 percent over the 2020–2050 period and to 79 percent by 2050.

**Growth of Real Earnings per Worker.** Projections of prices, nonwage compensation (such as employment-based health insurance), average hours worked, and labor productivity (discussed below) imply that real earnings per worker grow by an average of 1.0 percent annually over the 2020–2050 period. That rate is lower than the 1.1 percent average annual growth of real earnings per worker over the last 30 years.

**Distribution of Earnings.** In CBO's projections, earnings grow faster for higher earners than for lower earners. As a result, the share of earnings accruing to workers in the top 10 percent of the earnings distribution increases at an average rate of 0.2 percent per year. That rate of growth is lower than it was between 1978 and 2018, when the share of earnings accruing to workers in the top 10 percent of the earnings distribution increased by 0.6 percent per year.

The distribution of earnings affects revenues from income taxes and payroll taxes, among other things. Income taxes are affected by the earnings distribution because of the progressive rate structure of the individual income tax; people with lower income pay a smaller share of their earnings in taxes than people with higher income do.

Social Security payroll taxes are also affected by the earnings distribution. Those taxes are levied only on earnings up to a certain annual amount ($137,700 in 2020). Because earnings have grown more for higher earners than for others, the portion of covered earnings on which Social Security payroll taxes are paid has fallen from 90 percent in 1983 to 83 percent in 2018.[12] The

portion of earnings subject to Social Security taxes is projected to remain at 83 percent, on average, between 2020 and 2030 and fall to an average of 82 percent in the second decade and to an average of 81 percent in the third decade, equaling 81 percent in 2050. That decline in the share of covered earnings below the taxable maximum reduces the projected balance of the Social Security trust funds.

**Changes in Projections of Other Labor Market Outcomes Since Last Year.** Several projections of labor market outcomes are different from last year's projections. CBO's current projection of the unemployment rate is higher than it was last year in the first five years of the projection period but lower than it was last year in the final two decades of the period. In the first five years of the period, the projected unemployment rate is higher because of the recession caused by the pandemic and the ensuing slow recovery. The projected lower unemployment rate in the second and third decades is largely attributable to the agency's reassessment of the underlying long-run trend of unemployment. Because CBO now expects the labor force to have a larger percentage of older workers, as well as a larger percentage of more educated workers, CBO lowered its estimate of the underlying long-run trend of unemployment for the projection period.

CBO's current projections of real earnings per worker are slightly lower than last year's, mainly because updates to wage and salary data indicate that earnings as a share of GDP were, on average, lower over the past decade than previously reported. As a result, CBO reduced its projection of wages and salaries over the next three decades.

In CBO's current projections, earnings as a share of compensation are lower than previously projected. The projection is lower largely because an excise tax on high-premium health insurance, which was scheduled to take effect in 2022, was repealed. Had that tax not been repealed, some employers and workers would have been expected to choose insurance plans with smaller premiums to avoid paying the tax. Those shifts would have generally increased taxable wages, increasing earnings as a share of compensation.

---

11. For more details, see Congressional Budget Office, *How CBO Projects Income* (July 2013), www.cbo.gov/publication/44433.

12. Covered earnings are those received by workers in jobs subject to Social Security payroll taxes. Most workers pay payroll taxes on their earnings, although a small number—mostly in state and local government jobs or in the clergy—are exempt. No additional benefits accrue to earnings that exceed covered earnings.

CBO also projects that the distribution of earnings will differ from last year's projection. The share of earnings for the top 10 percent of earners in 2049 is projected to be 45.5 percent, or 1.5 percentage points lower than the projection from last year. That projection changed because data for recent years show a smaller-than-expected share of earnings accruing to high-wage earners, and CBO expects that trend to continue. Those recent data also caused CBO to increase its projection of the share of covered earnings on which Social Security payroll taxes are paid.

### Capital Accumulation and Productivity

In addition to the rate of labor force participation, labor force growth, and other labor market outcomes, two other factors directly affect CBO's projections of output. One is the accumulation of capital—structures and equipment, land, intellectual property such as computer software, and residential housing. That accumulated stock of capital contributes a stream of services to production. The second factor is the growth of TFP—real output per unit of combined labor and capital services in the various sectors of the economy. In CBO's projections, most TFP growth occurs in the nonfarm business sector, which accounts for about three-quarters of economic activity.

**Capital Services.** Over the longer term, in CBO's view, private saving, international flows of financial capital, and federal borrowing drive growth in the nation's stock of private capital. Private saving and international capital flows tend to move in tandem with the rate of return on investment—a rate that measures the extent to which investment in the stock of capital results in a flow of income. CBO's projection of that rate is consistent with the agency's projection that the average real interest rate on 10-year Treasury securities (calculated by subtracting the rate of increase in the consumer price index from the nominal yield on those notes) would be 0.9 percent in 2030 and 2.5 percent in 2050. The projected increase in federal borrowing would increase interest rates, thus reducing private investment and tamping down growth in the private capital stock.

**Total Factor Productivity.** The annual growth of TFP in the nonfarm business sector is projected to average 1.0 percent in the 2020–2030 period and 1.1 percent from 2030 to 2050, yielding an average annual growth rate of slightly less than 1.1 percent from 2020 to 2050. That projected growth rate is about 0.3 percentage

points slower than the average annual rate since 1950 of 1.4 percent and 0.2 percent slower than the average rate since 1990.

CBO projects nonfarm business TFP to grow more slowly than its long-term historical average for several reasons. Recent analysis of historical trends in TFP growth suggests that projections for the next few decades should place greater weight on slower recent growth than on faster growth in the more distant past. Thus, although CBO projects growth in nonfarm business TFP to accelerate from its unusually slow recent rate, the agency expects the future rate of growth to be slower than its long-term historical average.

A number of developments support CBO's projection of slower growth in nonfarm business TFP. One is the anticipated slower improvement in labor quality—a measure of workers' skills that accounts for educational attainment and work experience—that is implicitly included in CBO's measure of TFP. Labor quality improved rapidly during the 1980s and 1990s and more slowly after 2000. In CBO's assessment, that slowdown was the result of both a less rapid increase in average educational attainment and the continued retirement of the baby-boom generation, a large, experienced portion of the workforce. In future decades, however, that slower improvement in labor quality is expected to be partly offset by the overall aging of the workforce, as better health and longer life expectancy lead people to continue working past the ages at which previous generations retired. (Older workers generally have more experience than younger ones, and that group also includes a larger proportion of highly educated workers, who tend to remain in the labor force longer than workers with less education.)

Another development that affects nonfarm business TFP is changing federal investment in long-lived assets, such as buildings, roads, and intellectual property, that produce a stream of benefits to private businesses. In CBO's projections, federal discretionary spending declines to a much smaller percentage of GDP over the next decade than in past decades.[13] If federal investment spending generally remained unchanged as a share of discretionary

---

13. Discretionary spending includes most defense spending, outlays for highway programs, and spending for many other nondefense activities, such as elementary and secondary education, housing assistance, international affairs, and the administration of justice.

spending, reductions in discretionary spending as a percentage of GDP would mean that federal investment spending would also decrease as a share of GDP. A reduction in federal investment spending as a share of GDP would dampen growth in TFP, in CBO's assessment.[14]

CBO also estimated the effects of climate change on economic growth in future decades, drawing on studies that relate differences in regional economic activity and growth to differences in regional weather patterns, as well as studies of the economic effects of increases in hurricane damage.[15] In the agency's assessment, those effects slightly decrease growth in real GDP, reducing the level of real GDP by 1.0 percent by 2050, compared with growth had climate conditions remained the same through 2050 as they were at the end of the 20th century. However, a portion of those effects was already accounted for in the economic data the agency uses to make its projections. The share of such effects that was not already accounted for in CBO's projections is projected to reduce growth in nonfarm business TFP. Compared with last year's projections, TFP growth is lower on average by about 0.01 percentage point per year over the next decade and by nearly 0.03 percentage points per year from 2030 to 2050. As a result, the level of TFP is about 0.7 percent lower and the level of GDP about 0.6 percent lower in 2050 than the two metrics would have been without those additional effects.

**Real GDP per Hour Worked.** Given the projected growth of capital services and TFP described above, real GDP per hour worked (a measure of economy-wide productivity) is expected to grow by an annual average of 1.3 percent over the 2020–2050 period. Potential labor force productivity (potential output per member of the potential labor force) is also expected to grow by an annual average of 1.3 percent over the 2020–2050 period.

**Changes in Projections of Capital Accumulation and Productivity Since Last Year.** Several changes in CBO's projections have led the agency to lower its projection

of growth in capital services compared with last year's projection. First, the agency's projections of federal deficits are larger this year than they were last year, leading to more federal borrowing and thus more crowding out of private investment. Second, CBO has reduced its projection of labor force growth, reducing the need for investment to provide workers with capital. Third, CBO has revised its analytic methods to better account for the effects of slower population growth and slower formation of new households on private investment in residential housing. The agency now projects that as population growth and household formation continue to slow, housing starts and other forms of private investment will also grow more slowly in the long term, further reducing the projected growth of capital services.

The effects of long-term demographic trends and larger projected deficits on investment, along with the effects of climate change on the growth of nonfarm business TFP, reduce the projected growth of real GDP per hour worked from 2019 to 2049 by nearly 0.2 percentage points, from an annual average of 1.5 percent in last year's forecast to 1.3 percent this year. Because CBO expects slightly fewer people to hold multiple jobs and the unemployment rate to be slightly higher than the agency projected last year, the growth of potential labor force productivity is revised downward by only about 0.1 percentage point, slightly less than the growth of real GDP per hour worked.

**Inflation**
CBO projects rates of inflation for two categories: prices of consumer goods and services and prices of final goods and services.[16] Those rates influence nominal (current-dollar) levels of interest rates, income, and indexation of income tax brackets, thereby influencing tax revenues, various types of federal expenditures that are indexed for inflation, and interest payments on federal debt.

**Prices of Consumer Goods and Services.** One measure of consumer price inflation is the annual rate of change in the consumer price index for all urban consumers (CPI-U). Over the 2020–2050 period, that measure of inflation averages 2.1 percent in CBO's projections. That long-term rate is less than the average rate of inflation

---

14. For more details about how CBO estimates the macroeconomic effects of federal investment, see Congressional Budget Office, *The Macroeconomic and Budgetary Effects of Federal Investment* (June 2016), www.cbo.gov/publication/51628.

15. For more information about hurricanes, see Congressional Budget Office, *Potential Increases in Hurricane Damage in the United States: Implications for the Federal Budget* (June 2016), www.cbo.gov/publication/51518.

16. Final goods and services include those purchased directly by consumers, businesses (for investment), and governments, and also include net exports.

since 1990 of 2.4 percent per year. Under a chained measure of CPI-U inflation, CBO projects prices to grow at a rate that is about 0.25 percentage points less than the annual increase in the traditional CPI-U.[17]

**Prices of Final Goods and Services.** Over the 2020–2050 period, the annual inflation rate for all final goods and services produced in the economy, as measured by the rate of increase in the GDP price index, is projected to average 1.9 percent. That long-term rate is slightly lower than the average growth in the GDP price index since 1990. The GDP price index grows at a different rate than the consumer price index because it is based on the prices of a different set of goods and services and uses a different method of calculation.

**Changes in Projections of Inflation Since Last Year.** Inflation, as measured by growth in either the CPI-U or the GDP price index, is projected to be considerably lower from 2020 to 2024 than CBO projected last year. Lower inflation is an effect of the pandemic, which reduced the supply of certain goods and services, putting upward pressure on their prices, and caused demand for certain other goods and services to plummet, putting downward pressure on those prices. On net, in CBO's projections, the effects of the pandemic point to a significant drop in inflation over the next few years. Over the 2020–2024 period, CBO expects the CPI-U to grow at an average annual rate of 1.7 percent, significantly less than the average of 2.4 percent that the agency projected last year for the same period. The agency expects the GDP price index to grow at an average annual rate of 1.5 percent over the first five years of the projection period, substantially less than the 2.1 percent average that the agency projected for that period last year.

CBO revised its projection for the period after 2024 to better reflect the average effects of business cycles that are expected to occur in the remaining 25 years of the projection period. Historical data show that during and after economic downturns, actual output falls short of potential output to a greater extent and for longer periods than actual output exceeds potential output during economic booms. On average, that observed asymmetry decreases the demand for goods and services, resulting in less upward pressure on prices. To reflect that historical experience, CBO reduced average inflation slightly in the second and third decades of the projection period. CBO also slightly reduced the projected difference in growth rates between the GDP price index and the CPI-U to better reflect recent historical data. The difference between the inflation rates for those two price indexes is now projected to average 0.3 percentage points in the second and third decades of the projection period, about 0.1 percentage point less than last year's projection. As a result of those changes, over the second and third decades of the projection period, the GDP price index grows less than 0.1 percentage point more slowly, on average, than in last year's projection, and the CPI-U grows about 0.2 percentage points more slowly.

**Interest Rates**
CBO projects the interest rates that apply to federal borrowing, including the rates on 10-year Treasury notes and special-issue Social Security bonds. It also projects the average interest rates on federal debt held by the public and on the bonds held in the Social Security trust funds. Those rates influence the cost of the government's debt burden and the balances of the trust funds.

After considering a number of changes in its projections from last year, including slower growth in the labor force, slower growth in TFP, and more government debt, CBO expects real interest rates on federal borrowing to be lower in the future than their average over the 1990–2007 period, the period CBO uses for historical comparison. The real interest rate on 10-year Treasury notes averaged roughly 3.1 percent between 1990 and 2007.[18] That rate has averaged 0.8 percent since 2009 and is projected to be 0.9 percent in 2030. In CBO's projections, the rate rises thereafter, reaching 2.5 percent in 2050. That rate is 0.6 percentage points below the average real interest rate on 10-year Treasury notes over the 1990–2007 period. CBO's current projections of real interest rates over the 2020–2049 period are lower,

---

17. The chained CPI-U tends to grow more slowly than the traditional CPI-U for two reasons. First, it uses a formula that better accounts for households' tendency to substitute similar goods and services for each other when relative prices change. Second, unlike the CPI-U, the chained CPI-U is little affected by statistical bias related to the sample sizes that the Bureau of Labor Statistics uses in computing each index. Historically, inflation as measured by the chained CPI-U has been about 0.25 percentage points lower, on average, than inflation as measured by the CPI-U. CBO's projections reflect that average difference between the two measures.

18. Historical inflation rates are taken from the consumer price index, adjusted to account for changes over time in the way that the index measures inflation. See Bureau of Labor Statistics, "CPI Retroactive Series Using Current Methods (R-CPI-U-RS)" (August 5, 2020), www.bls.gov/cpi/research-series/home.htm.

on average, than last year's projections because of the unprecedented low rates caused by the pandemic and the prolonged recovery from the pandemic that is expected to occur. After 2030, the real interest rate on 10-year Treasury notes is expected to rise at a faster pace than projected last year because debt as a share of GDP rises at a faster pace than was projected last year. By 2049, the agency projects the real interest rate on the 10-year Treasury note to reach 2.5 percent, 0.3 percentage points higher than last year's projection.

**Factors Affecting Interest Rates.** Interest rates are determined by a number of factors. CBO projects those rates by comparing how the values of factors that affect them are expected to differ in the long term relative to those factors' average values over the 1990–2007 period. That period was chosen for comparison because expectations of inflation were stable and there were no severe economic downturns or significant financial crises.[19]

Some factors reduce interest rates; others increase them. In CBO's estimates for the 2020–2050 period, several factors tend to reduce interest rates on government securities below their 1990–2007 average:

- The labor force is projected to grow much more slowly than it did from 1990 to 2007. Slower growth in the number of workers tends to increase the amount of capital per worker in the long term, reducing the return on capital and, therefore, also reducing the return on government bonds and other investments.[20]

- The share of total earnings received by higher-earning households is expected to be larger in the future than during the 1990–2007 period. Higher-income households tend to save a greater proportion of their income, so the difference in the distribution of earnings is projected to increase the total amount of saving available for investment, other things being

equal. As a consequence, the amount of capital per worker is projected to rise, and interest rates are expected to be lower.

- TFP is projected to grow more slowly in the future than it did from 1990 to 2007. For a given rate of investment, a lower rate of productivity growth reduces the return on capital and results in lower interest rates, all else being equal.

- CBO expects investors' preference for Treasury securities over riskier assets to remain greater than it was during the 1990–2007 period. Investors began to have less appetite for risk in the early 2000s, and the demand for low-risk assets was strengthened by the economic fallout from the 2007–2009 recession, the slow expansion that followed, and the response of financial institutions to increased regulatory oversight. The recent recession caused by the pandemic further increased investors' demand for Treasury securities instead of riskier assets. That greater demand contributed to lower interest rates for Treasury securities. CBO expects the preference for Treasury securities to gradually decline over the next three decades but to remain stronger than it was from 1990 to 2007.

At the same time, in CBO's estimates, several factors tend to boost interest rates on government securities above their average over the 1990–2007 period:

- In CBO's extended baseline projections, federal debt is much larger as a percentage of GDP than it was before 2007, reaching 109 percent by 2030 and 195 percent by 2050. The latter figure is about five times the average over the 1990–2007 period. Greater federal borrowing tends to crowd out private investment in the long term, reducing the amount of capital per worker and increasing both interest rates and the return on capital over time.

- The capital share of income—the percentage of total income that is paid to owners of capital—has been rising for the past few decades. That share is projected to decline from its current level over the next decade but to remain greater than its average in previous decades. The factors that appear to have contributed to capital's rising share of income (such as technological change and globalization) are likely to persist, keeping it above the historical average. In CBO's estimation, a larger share of income accruing

---

19. A Bank of England study identified a similar set of determinants that account for the decline in real interest rates over the past 30 years. See Rachel Lukasz and Thomas D. Smith, *Secular Drivers of the Global Real Interest Rate,* Staff Working Paper 571 (Bank of England, December 2015), https://tinyurl.com/y3mrtoyv (PDF, 1.8 MB).

20. For more information about the relationship between the growth of the labor force and interest rates, see Congressional Budget Office, *How Slower Growth in the Labor Force Could Affect the Return on Capital* (October 2009), www.cbo.gov/publication/41325.

to owners of capital would directly boost the return on capital and, thus, interest rates.

- The retirement of members of the baby-boom generation and slower growth in the size of the labor force means that fewer workers are in their prime saving years relative to the number of older people who are drawing down their savings, CBO projects. As a result, the total amount of saving available for investment is projected to be less than it otherwise would be (all else being equal). CBO expects that decrease to reduce the amount of capital per worker and thereby push up interest rates. (CBO estimates that the effect of that decrease only partially offsets the positive effect of increased earnings dispersion on saving, leaving a net increase in the amount of savings available for investment.)

- CBO expects emerging-market economies to attract a greater share of foreign investment in coming decades than they did in the 1990–2007 period. As those economies recover from the global economic downturn caused by the pandemic, they become increasingly attractive destinations for foreign investment. CBO projects that development to put upward pressure on interest rates in the United States.

Some factors mentioned above are easier than others to quantify. For instance, the effect of labor force growth and rising federal debt can be estimated from available data by using theoretical models and the findings of existing research. The extent to which other factors affect interest rates is more difficult to estimate. A shift in preferences for low-risk rather than high-risk assets is not directly observable, for example. That shift is especially uncertain in light of the unprecedented increase in federal debt in response to the pandemic and recession. It is difficult to anticipate how financial markets will respond to that rising debt once the economy begins to recover. The effect on interest rates of changes in the distribution of earnings is also difficult to quantify.

In light of those sources of uncertainty, CBO relies not only on economic models and findings from the research literature but also on information from financial markets to guide its assessments of the effects of various factors on interest rates over the long term. The current rate on 30-year Treasury bonds, for example, reflects market participants' judgments about the path that interest rates on short-term securities will take 30 years from now. The rate on 30-year Treasury bonds since the onset of the

recession caused by the pandemic points to considerably lower interest rates well into the future than the interest rates of recent decades.

**Projections of Interest Rates.** The nominal interest rate on 10-year Treasury notes is projected to average 3.3 percent over the 2020–2050 period and to reach 4.8 percent in 2050. The real interest rate on 10-year Treasury notes is projected to average 1.1 percent over that period and to be 2.5 percent in 2050.
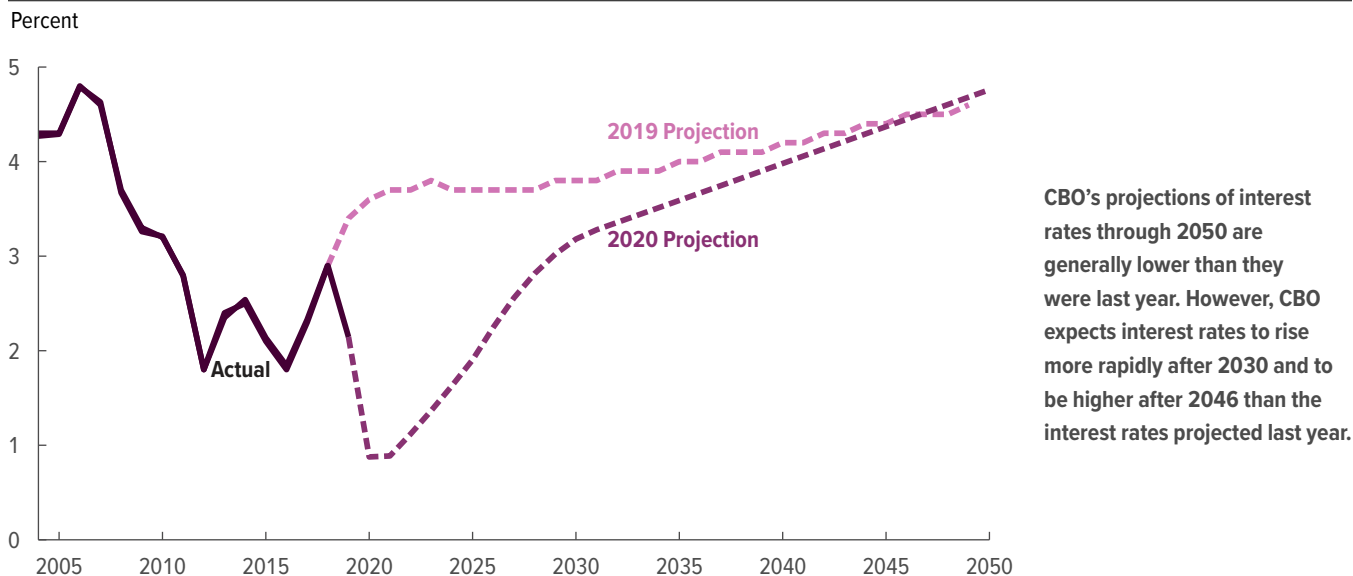
The average interest rate on federal debt held by the public tends to be lower than the rates on 10-year Treasury notes because interest rates are generally lower on shorter-term debt than on longer-term debt and because Treasury securities are expected to mature, on average, over periods of less than 10 years.[21] CBO projects a 0.4 percentage-point difference between the rate on 10-year Treasury notes and the effective rate on federal debt over the 2020–2050 period. That difference is projected to average 0.5 percentage points over the next decade. The difference is larger before 2031 because the federal debt consists of the Treasury securities issued during the recession caused by the pandemic. CBO projects the difference to decrease to 0.3 percentage points by 2035 as the earlier securities with relatively low interest rates mature, and to remain at 0.3 percentage points thereafter. The same factors that increase interest rates would also increase the effective interest rate on federal debt held by the public between 2040 and 2050. In CBO's projections, the average nominal interest rate on federal debt held by the public is about 2.9 percent for the 2020–2050 period, reaching 4.4 percent in 2050.

The Social Security trust funds hold special-issue bonds that generally earn interest at rates that are higher than the average rate of interest on federal debt. In CBO's projections, the nominal interest rate on bonds newly issued to the trust funds is equal to the rate on 10-year Treasury notes; it averages 3.3 percent over the 2020–2050 period and reaches 4.8 percent in 2050. The corresponding real rates are 1.1 percent, on average, over the full period and 2.5 percent in 2050.

Because interest rates have been low for much of the past decade and because the pandemic has driven rates even lower, the average interest rate earned by all bonds (both

---

21. Over the next decade, CBO expects the difference between the rate on 3-month Treasury bills and the rate on 10-year Treasury notes to average 0.8 percentage points.

**Figure A-3.**

## CBO's 2019 and 2020 Projections of the Interest Rate on 10-Year Treasury Notes

Percent



CBO's projections of interest rates through 2050 are generally lower than they were last year. However, CBO expects interest rates to rise more rapidly after 2030 and to be higher after 2046 than the interest rates projected last year.

Source: Congressional Budget Office.

Data are fourth-quarter values.

new and previously issued) held by the Social Security trust funds is projected to be slightly lower than the interest rate on bonds issued over the next decade. The average interest rate on all bonds, which CBO uses to calculate the present value of future streams of revenues and outlays for those funds, is projected to average 3.3 percent for the 2020–2050 period.[22]

**Changes in Projections of Interest Rates Since Last Year.** CBO's projections of interest rates in this year's long-term budget outlook are generally lower than they were last year (see Figure A-3). However, CBO expects interest rates to rise more rapidly after 2030 and to be higher than last year's projected interest rates after 2046.

CBO lowered its projection of average nominal interest rates. The nominal rates on 10-year Treasury notes and Social Security bonds are projected to average 3.3 percent over the 30-year projection period. Last year, CBO projected both rates to average 4.0 percent over the

30-year period. The agency also lowered its projection of average real interest rates. The real rates on 10-year Treasury notes and Social Security bonds are projected to average 1.1 percent over the 30-year projection period. Last year, CBO projected that both rates would average 1.6 percent over the 30-year period.

CBO's projections of lower average interest rates over the coming decade are primarily the result of factors related to the recession caused by the pandemic. That recession prompted CBO to lower its forecasts of investment demand, labor force growth, and productivity growth. Those lower forecasts point to lower interest rates. The Federal Reserve's policy actions—lowering the federal funds rate to near zero and increasing purchases of Treasury and other securities—put additional downward pressure on both short-term and long-term interest rates. The recession also caused investors' appetite for risk to decline (and, consequently, the demand for Treasury securities to rise). CBO expects those factors to continue to weigh down interest rates over the next several years.

Beyond the next decade, CBO expects investors' appetite for risk to increase, but at a slower pace than previously projected. CBO expects more private saving in the

---

22. A present value is a single number that expresses a flow of past and future income or payments in terms of an equivalent lump sum received or paid at a specific time. The value depends on the rate of interest, known as the discount rate, that is used to translate past and future cash flows into current dollars at that time.

United States and greater net capital inflows from foreign economies than it did in last year's projections, and those two factors put downward pressure on real interest rates. CBO has also increased its projection of the share of income paid to capital. When a greater share of income is paid to owners of capital, interest rates go up, somewhat offsetting the factors that are pushing interest rates down. CBO's reduced projections for interest rates are consistent with signals from financial markets that participants have lowered their long-term expectations for interest rates since the agency released its long-term projections last year.

Another reason CBO lowered its projection of nominal interest rates is that it projects the average rate of inflation to be lower. The agency's 0.2 percentage-point downward revision to CPI-U inflation over the second and third decades of the projection period accounts for 0.2 percentage points of the projected reduction in nominal interest rates over that period.

Although the agency lowered its projection of average interest rates over the projection period, it expects interest rates to rise more quickly between 2030 and 2050 than it projected for the 2029–2049 period last year, with the 10-year Treasury note rate rising to 4.7 percent by 2049, higher than was projected for 2049 last year. That steeper rise occurs because the agency increased its projection of debt as a share of GDP.