



CBO's Projections of Economic and Demographic Trends

The long-term outlook for the federal budget as described in this report was developed on the basis of the Congressional Budget Office's projections for a host of economic and demographic trends for the next three decades. (Average values for 2016 to 2046, the period encompassed by CBO's extended baseline, are shown in Table A-1. A set of annual projections is included in the supplemental data for this report, available online at www.cbo.gov/publication/51580.)

CBO's Approach to Economic Projections

Through 2026, the economic projections presented in this volume are the same as those that CBO published in its January 2016 forecast (which underlies the agency's most recent 10-year budget projections).¹ For the years beyond 2026, CBO's projections generally reflect historical trends and projected demographic changes.

Comparing this year's economic projections with last year's is complicated by a change in CBO's approach. This year, the detailed economic projections account for the macroeconomic effects of fiscal policy; the detailed projections shown in Appendix A of last year's report, *The 2015 Long-Term Budget Outlook*, did not. Instead, the detailed 2015 economic projections were "benchmark" projections, consistent with a constant ratio of debt to gross domestic product (GDP) and constant marginal tax rates. Some of the macroeconomic effects of the fiscal policies embodied in the extended baseline, and their feedback effects on the budget, were presented separately last year.²

The result is that the estimates of economic variables presented in this appendix are not strictly comparable to those CBO published last year. Where possible, this year's appendix highlights differences between this year's and last year's projections that incorporate the effects of fiscal policy. Nonetheless, most economic variables reported here are not strongly affected by fiscal policy, and the demographic projections are not affected at all. Where the effects did have a notable influence on CBO's projections, this appendix highlights those effects for this year's projections.

Economic Variables

The performance of the U.S. economy in coming decades will affect the federal government's tax revenues, spending, and debt accumulation. To estimate those effects, CBO projects trends in such key economic variables as the size and composition of the labor force, the number of hours worked, earnings per worker, capital accumulation, productivity, inflation, and interest rates. The agency also considers ways in which fiscal policy influences economic activity. (Chapter 6 of this volume discusses the economic effects of some alternative paths for deficits and debt accumulation.)

Gross Domestic Product

CBO projects that a recovery in aggregate demand will spur more rapid growth in real (inflation-adjusted) GDP over the next few years than the economy has experienced, on average, since the recession ended. Thereafter, real GDP is projected to grow at a pace that reflects increases in the supply of labor, capital services, and productivity that are consistent with the changes in marginal tax rates and increases in federal debt that CBO is projecting in its extended baseline.

CBO's projection of real GDP growth—an annual average of 2.1 percent over the 2016–2046 period—is similar to last year's projection. However, the growth rate is significantly slower than the 2.6 percent rate of the past three decades, primarily because of the anticipated slower growth of the labor force. Moreover, as the labor force

1. See Congressional Budget Office, *Updated Budget Projections: 2016 to 2026* (March 2016), www.cbo.gov/publication/51384, and *The Budget and Economic Outlook: 2016 to 2026* (January 2016), Chapter 2, www.cbo.gov/publication/51129.

2. For a longer discussion of the projections that incorporated effects of fiscal policy under current law, see Congressional Budget Office, *The 2015 Long-Term Budget Outlook* (June 2015), Chapter 6, www.cbo.gov/publication/50250.

Table A-1.

Average Annual Values for Economic and Demographic Variables That Underlie CBO's Extended Baseline

	2016–2026	2027–2036	2037–2046	Overall, 2016–2046
Economic Variables (Percent)				
Growth of GDP				
Real GDP	2.1	2.0	2.1	2.1
Nominal GDP	4.1	4.1	4.2	4.1
Growth of the Labor Force	0.6	0.3	0.4	0.4
Unemployment				
Unemployment rate	4.9	5.0	4.8	4.9
Natural rate of unemployment	4.8	4.7	4.6	4.7
Growth of Average Hours Worked	-0.1	-0.1	*	-0.1
Growth of Total Hours Worked	0.5	0.3	0.4	0.4
Earnings as a Share of Compensation	81	81	81	81
Growth of Real Earnings per Worker	1.2	1.3	1.3	1.3
Share of Earnings Below the Taxable Maximum	80	77	77	78
Growth of Capital Services	2.4	1.8	1.9	2.0
Growth of Productivity				
Total factor productivity	1.3	1.3	1.3	1.3
Labor productivity	1.6	1.7	1.8	1.7
Inflation				
Growth of the CPI-U	2.3	2.4	2.4	2.4
Growth of the GDP price index	2.0	2.0	2.0	2.0
Interest Rates				
Real rates				
On 10-year Treasury notes and the OASDI trust funds	1.6	1.9	2.2	1.9
On all federal debt held by the public	0.8	1.5	1.9	1.4
Nominal rates				
On 10-year Treasury notes and the OASDI trust funds	3.9	4.3	4.6	4.3
On all federal debt held by the public	3.1	4.0	4.3	3.7
Demographic Variables				
Growth of the Population (Percent)	0.8	0.7	0.5	0.7
Fertility Rate (Children per woman)	1.9	1.9	1.9	1.9
Immigration Rate (Per 1,000 people in the U.S. population)	3.9	3.9	3.8	3.8
Life Expectancy at Birth, End of Period (Years) ^a	80.6	81.8	83.0	83.0
Life Expectancy at Age 65, End of Period (Years) ^a	20.2	20.9	21.6	21.6

Source: Congressional Budget Office.

The extended baseline generally reflects current law, following CBO's 10-year baseline budget projections through 2026 and then extending most of the concepts underlying those baseline 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 (Social Security); * = between -0.05 percent and zero.

a. 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.

grows more slowly than the overall population, per capita real GDP is expected to increase more slowly than it has in the past—at an average annual rate of 1.4 percent over the 2016–2046 period, compared with 1.6 percent for the past 30 years.

Over the long term, total GDP is projected to be one-half of one percent below its potential (maximum sustainable) amount. That projection is based on CBO's estimate that actual GDP was roughly that much lower than potential GDP, on average, from 1961 to 2009 and lower than potential GDP, on average, in each of the

past five business cycles. Those outcomes reflect CBO's assessment that actual output has fallen short of potential output during and after economic downturns to a larger extent and for longer periods than actual output has exceeded potential output during economic booms.³

Labor Market

Among the factors accounted for in CBO's labor market projections are the size of the labor force, the unemployment rate, the average number of hours that people work, and various measures of workers' earnings.

Growth of the Labor Force. The growth of the labor force has slowed progressively over the past few decades, but particularly since 2007. For the 2016–2046 period, CBO projects that the number of workers will increase by about 0.4 percent per year, on average. That rate is faster than the average since 2007 and similar to the rate CBO projected last year, but less than half the average for the past 30 years.

That slowdown in the pace relative to earlier decades is anticipated to result both from more workers' leaving the labor force (because of the burgeoning retirement of the baby-boom generation, despite the gradual increase in the average retirement age) and from fewer workers' entering it. The drop in new entrants will result from three trends. First, birth rates are declining: The nation's fertility rate has fallen by nearly 50 percent since 1960, to slightly below 2 today (discussed later under "Fertility" on page 103). As a result, the annual growth rate of the population between the ages of 20 and 64, which averaged about 1.0 percent over the past 30 years, is projected to slow to about 0.4 percent over the 2016–2046 period. Next, the participation of women in the labor force, which peaked in 1999, has declined slightly since then. (Participation rates among working-age men also have declined.) And finally, CBO estimates, some fiscal policies projected in the extended baseline would tend to reduce incentives to work. Notably, rising federal debt and increasing marginal tax rates (attributable to growth in real income) would limit the growth of after-tax wages, and continued growth in nongroup health insurance coverage under the Affordable Care Act over the next decade would reduce the need for employment-based coverage.

CBO expects that those forces will be modestly offset by a pair of trends working in the opposite direction. First, increasing longevity will lead people to work longer: In the coming decades, the average person is likely to work about three months longer for each additional year of life expectancy. Thus, if life expectancy was four years longer for one cohort of workers than for an earlier one, the longer-lived cohort would work about a year longer, all else being equal. Second, the population is becoming more educated, and workers with more education tend to stay in the labor force longer than do people with less education.

The Unemployment Rate. CBO projects that the unemployment rate will decline from 5.0 percent at the end of 2015 to 4.4 percent in 2017, rise again gradually to 5.0 percent by 2020, and then remain at that level through 2026. In the meantime, the natural rate of unemployment (which results from all sources other than fluctuations in overall demand related to the business cycle) will gradually decline from 4.9 percent to slightly less than 4.8 percent.⁴ From 2021 onward, CBO projects, the unemployment rate will remain about one-quarter of a percentage point above the natural rate, which is consistent with the historical average relationship between the two measures and with the projected gap of one-half of one percent between actual and potential GDP.

After 2026, the actual and natural rates of unemployment are both projected to decline gradually as a result of changes in demographics and education: Older and more educated workers tend to have lower actual and natural rates of unemployment, so those rates will decline as the labor force ages and becomes increasingly more educated. By 2046, the natural rate is projected to be slightly less than 4.6 percent, and the actual rate is projected to be about 4.8 percent. The adoption of projections of age- and education-specific natural rates of unemployment results in lower rates than CBO published last year, when the agency projected that the natural rate of unemployment would gradually decline to about 5.3 percent by the end of 2017 and to 5.2 percent by the end of 2020 and remain at 5.0 percent from 2027 onward.

Average Hours Worked. Different subgroups of the labor force work different numbers of hours, on average. Men tend to work more hours than women do, and people

3. See Congressional Budget Office, *Why CBO Projects That Actual Output Will Be Below Potential Output on Average* (February 2015), www.cbo.gov/publication/49890.

4. That decline reflects the decreasing share of younger workers and the rising share of older workers in the working-age population: Older workers have lower unemployment rates than younger ones, so the changing shares will reduce the overall rate.

between the ages of 30 and 40 tend to work more than people between the ages of 50 and 60. CBO's projections are based on the assumption that those differences among groups will remain stable. However, the agency also expects that over the long term, the composition of the labor force will shift toward groups that tend to work less (such as older workers). As a result, the average number of hours worked by the labor force as a whole will decline slightly. CBO estimates that by 2046, the average number of hours per worker will be about 2 percent less than it is today, about the same change in hours per worker that CBO projected last year.

Total Hours Worked. Total hours worked will increase at an average annual rate of 0.4 percent between 2016 and 2046, CBO estimates, on the basis of projections of the size of the labor force, average hours worked, and unemployment. That estimate matches last year's projection for the 2015–2040 period.

Earnings as a Share of Compensation. Workers' total compensation consists of taxable earnings and nontaxable benefits, such as paid leave and employers' contributions to health insurance and pensions. Over the years, the share of total compensation paid in the form of earnings has slipped—from about 90 percent in 1960 to about 81 percent in 2015—mainly because the cost of health insurance has risen more quickly than has total compensation.⁵

CBO expects that trend in health care costs to continue, and that by itself would further decrease the proportion of compensation that workers receive as earnings. However, starting in 2018, the Affordable Care Act will impose an excise tax on some employment-based health insurance plans that have premiums above specified amounts. Some employers and workers will respond by shifting to less expensive plans, thereby reducing the share of compensation consisting of health insurance premiums and increasing the share that consists of earnings. CBO projects that the effects of the tax on the mix of compensation will roughly offset the effects of rising costs for health care for a few decades; after that, the effects of rising health care costs will outweigh those of the excise tax.⁶ As a result, the share of compensation that workers receive as earnings is projected to remain near 81 percent through 2046, which is about the same as CBO projected last year. (For more on the projected effects of the excise

tax, see Chapter 5; for more on projected changes in health care costs, see Chapter 3.)

Growth of Real Earnings per Worker. Trends in prices, the growth of nonwage compensation (such as employment-based health insurance), and average hours worked imply that real earnings per worker will grow by an average of 1.2 percent annually over the 2016–2026 period and by 1.3 percent per year over the 2016–2046 period. Last year, CBO projected that growth in real earnings per worker would average 1.4 percent between 2015 and 2040. The current projection is lower because it accounts for changes in fiscal policy that would result in slower growth of output and earnings; the detailed economic projections published in *The 2015 Long-Term Budget Outlook* did not account for such effects.

Share of Earnings Below the Taxable Maximum. Social Security payroll taxes are levied only on earnings up to a maximum annual amount (\$118,500 in 2016). Below that amount, earnings are taxed at a combined rate of 12.4 percent, split between the employer and employee (self-employed workers pay the full amount); no tax is paid on earnings above the cap. The taxable maximum has remained a nearly constant proportion of the average wage since the mid-1980s, but 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 82 percent now.⁷ CBO projects that the unequal growth in earnings will continue for the next decade and then stop: The portion of earnings subject to Social Security taxes is projected to fall below 78 percent by 2026 and to remain near that level thereafter. That share is about 1 percentage point lower than CBO projected last year.

The most recent projections, which reflect a reexamination of recent trends, show an increased rate of growth of wages and salaries for higher-income taxpayers relative to the growth of such income for other taxpayers and also

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

6. CBO anticipates that the effects of the excise tax on the taxable share of compensation will diminish over time, both because it expects that most people will continue to want a significant amount of health insurance and because the Affordable Care Act set minimum amounts of coverage for health insurance plans. Therefore, the number of additional people moving to less expensive insurance plans will eventually dwindle.

7. 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.

relative to the growth rates that CBO had previously incorporated into its projections. That adjustment pushed more wages and salaries in CBO's projections above the taxable maximum.

Capital Services

Over the longer term, growth in the nation's stock of capital and in the flow of productive services from that stock will be driven by economic output, private saving, federal borrowing, marginal tax rates, and international flows of financial capital, CBO estimates. In particular, capital services will expand slightly more slowly than output after 2026 because of rising debt and increasing marginal tax rates.

CBO's projection of growth in the flow of real capital services is slightly below the rate it projected last year, largely because the agency improved its method for estimating the productive services that flow from different types of assets. That change led CBO to lower its estimates of historical and projected growth of capital services in the nonfarm business sector even though the historical data that the agency uses to estimate capital services are largely unchanged. In addition, in this year's projection, the greater accumulation of federal debt crowds out investment, further dampening the growth of capital services. As a result, CBO projects the flow of real capital services to grow at an average rate of 2.0 percent per year between 2016 and 2046.

Total Factor Productivity

The annual growth of total factor productivity (TFP, the average real output per unit of combined labor and capital services) is projected to increase from about 0.5 percent in 2015 to about 1.4 percent in 2022 and then to slow slightly through 2046, yielding an average annual growth rate of 1.3 percent from 2016 to 2046, or about 0.2 percentage points slower than the average annual rate of nearly 1.5 percent since 1950 and about the same as the average rate since 1990.

The projected path for TFP reflects several considerations that, in CBO's judgment, suggest growth in coming decades that is slower than the long-term historical average. For example, with the exception of a period of rapid growth in the late 1990s and early 2000s, productivity has tended to grow more slowly in recent decades than it has since the 1950s and 1960s. The long-term trend suggests that projections for the next few decades should place somewhat more weight on more recent, slower growth than on the more rapid growth of the more

distant past. Thus, although CBO's projections include an acceleration in TFP from its particularly slow recent growth, the agency anticipates that TFP will return to a growth rate that is somewhat slower than its long-term average.

Some developments in particular support such projections for TFP, among them the recent slow growth in labor quality (a measure of workers' skills that accounts for educational attainment and work experience) following a relatively rapid rise over the past few decades. In CBO's judgment, that change results both from a gradual, persistent, long-term slowdown in the increase in average educational attainment and from the burgeoning retirement of a relatively large and skilled portion of the workforce—the baby-boom generation. The decline will be partly offset, however, by the aging of those remaining in the labor force over the next few decades, particularly as better health and longer life expectancy lead people to stay in the workforce longer than did members of previous generations. An older workforce generally has a larger proportion of more highly educated workers because those workers tend to remain in the labor force longer than do workers with less education.

Another factor that is projected to slow the growth of TFP is a reduction in the amount projected for federal investment. Under the assumptions used for CBO's baseline, the government's nondefense discretionary spending is projected to decline over the next decade to a much smaller percentage of GDP than it has averaged in the past. About half of nondefense discretionary spending from the 1980s onward consisted of federal investments in physical capital (such as roads), education and training, and research and development—all contributing to TFP growth. So lower nondefense discretionary spending as a percentage of GDP would mean less federal investment, causing growth in TFP to slow somewhat.

Although CBO's projection in 2015 was also for average TFP growth of 1.3 percent, that consistency is the product of offsetting changes. Because TFP reflects the portion of growth in real GDP that is not attributable to changes either in hours worked or in capital services, the downward revision to capital services in earlier years resulted in a corresponding increase in historical TFP. Higher historical growth in TFP in turn suggests higher growth in the future than CBO previously projected. That change, however, was offset in CBO's projections not only because CBO placed more weight on the considerations discussed above for trends in TFP but also

because recent updates and revisions to historical output data led CBO, in developing its projections, to place more weight on the unexpected and persistent recent weakness in TFP growth.

Labor Productivity

The growth rates projected for the labor supply, the capital stock, and TFP result in CBO's projection of the average growth of labor productivity (real output per hour worked) of 1.7 percent annually over the 2016–2046 period. Last year, that growth was projected to average 1.8 percent between 2015 and 2040. The current projection is lower mainly because this year's estimate accounts for effects of fiscal policy in the extended base-line that would result in slower growth of investment.

Inflation

CBO projects the rate of inflation in the prices of various categories of goods and services as measured by the annual rate of change in the consumer price index for urban wage earners and clerical workers and in the consumer price index for all urban consumers (CPI-U). CBO projects that inflation will average 2.4 percent over the 2016–2046 period. (In the long term, both indexes are projected to increase at the same rate.) That long-term rate is slightly less than the average rate of inflation since 1990, when growth in the CPI-U averaged 2.5 percent per year, and slightly more than the 2.3 percent average rate that CBO projected last year for the 2015–2040 period. The change reflects the fact that CBO projected—accurately, as it turns out—that the rate of inflation would be particularly low in 2015, a year that is no longer encompassed by the long-term projections.

After 2018, 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 0.4 percentage points less than the annual increase in the consumer price indexes.⁸ The GDP price index grows more slowly than the consumer price indexes because it is based on the prices of a different set of goods and services and because it is based on a different method of calculation. The projected gap between the CPI-U and the GDP price index is unchanged from last year's estimate.

8. Final goods and services are those purchased directly by consumers, businesses (for investment), and governments, as well as net exports.

Interest Rates

CBO makes projections of the interest rates, both real and nominal, that apply to federal borrowing, including the rate on 10-year Treasury notes, the average rate on holdings of the Social Security trust funds, and the average rate on federal debt held by the public.

After considering several factors, including slower growth of the labor force, CBO expects real interest rates on federal borrowing to be lower in the future than they have been, on average, over the past few decades. The real interest rate on 10-year Treasury notes (calculated by subtracting the rate of increase in the consumer price index from the nominal yield on those notes) averaged roughly 3.1 percent between 1990 and 2007.⁹ That rate has averaged 0.8 percent since 2009 and is projected to be 1.7 percent in 2026. In CBO's projections, the rate continues to rise thereafter, reaching 2.3 percent in 2046, 0.7 percentage points lower than its average over the past few decades.

Factors Affecting Interest Rates. Analysts who wish to use past trends as a starting point for long-term projections of interest rates must exercise judgment about which periods to examine. Real interest rates were low in the 1970s because of an unexpected surge in inflation; in the 1980s, when inflation declined at an unexpectedly rapid pace, real rates were high.¹⁰ Interest rates fell sharply during the financial crisis and recession that began in 2007.

9. Between 1970 and 2007, the real interest rate on 10-year Treasury notes averaged 3.2 percent; the average from 1953 to 2007 was 2.9 percent. 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 Research Series Using Current Methods (CPI-U-RS)" (April 13, 2016), www.bls.gov/cpi/cpiurs.htm.

10. CBO calculates real interest rates by subtracting expected rates of inflation from nominal interest rates. Borrowers and lenders agree to nominal interest rates after accounting for their expectations of what inflation will be. However, if rates are set under the expectation that inflation will be a certain percentage and it ends up being higher, real interest rates will turn out to be lower than anticipated. If inflation ends up lower than expected, the opposite will occur. CBO's approach is based on an assumption that the actual consumer price index, adjusted to account for changes over time in the way that the index measures inflation, is a useful proxy for expectations of inflation. One drawback is that if inflation trends are changing rapidly over time, changes in expectations may lag behind changes in actual inflation. Although CBO's approach could mismeasure expectations of inflation and real interest rates in some years, the way inflation has fluctuated over time suggests that CBO's approach yields useful measurements for 30-year averages.

To avoid using any of those possibly less representative periods, CBO considered average interest rates and their determinants for the 1990–2007 period and then judged how different those determinants might be over the long term.¹¹ Some factors reduce interest rates; others increase them. In CBO’s assessment, over the 2016–2046 period, several factors will probably reduce interest rates on government securities relative to their 1990–2007 average:

- The labor force is projected to grow much more slowly than it has for the past few decades. If everything else remains equal (including the unemployment rate), that slower growth in the number of workers will tend 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.¹²
- The share of total income received by high-income households is expected to be larger in the future than it has been during the past few decades. Higher-income households tend to save a greater proportion of their income, so the difference in the distribution of income will increase the total amount of savings available for investment, other things being equal. As a consequence, the amount of capital per worker will rise and interest rates will fall.
- TFP will grow slightly more slowly in the future than it has in recent decades, CBO projects. For a given rate of investment, lower productivity growth reduces the return on capital and results in lower interest rates, all else being equal.
- The risk premium—the additional return that investors require to hold assets that are riskier than Treasury securities—will probably remain higher in the future than its average over the 1990–2007 period. Financial markets were already showing less appetite for risk in the early 2000s, resulting in higher risk

premiums than in the 1990s. CBO expects the demand for low-risk assets to be further strengthened by the economic fallout from the financial crisis, the slow subsequent recovery, and financial institutions’ response to increased regulatory oversight. Moreover, the greater riskiness perceived for investments in countries with emerging market economies is likely to increase demand for U.S. assets (particularly federal debt) that are considered to be relatively risk-free. That rise in demand will lead to lower returns on those assets (that is, to lower interest rates).

At the same time, in CBO’s assessment, several factors will tend to boost interest rates on government securities relative to their average over the 1990–2007 period:

- Under the extended baseline, federal debt would be much larger as a percentage of GDP than it was before 2007—reaching 86 percent by 2026 and 141 percent by 2046. The latter figure is three and a half times the average of the 1990–2007 period. Higher federal debt tends to crowd out private investment in the long term, reducing the amount of capital per worker and increasing both the return on capital and interest rates.
- Net inflows of capital from other countries will be smaller as a percentage of GDP in the future than they have been, on average, in recent decades, CBO projects. In the 1990s and early-to-middle 2000s, rapid economic growth and high rates of saving in various nations with emerging market economies led to large flows of capital from those countries to the United States. Two types of developments are likely to affect those flows in the future. On one hand, as those nations’ economies continue to grow, their consumption will probably increase relative to saving—because markets for their debt will develop and because average citizens will tend to receive more of the gains from economic growth—and their demand for domestic investment will rise. On the other hand, recent weakness in the outlook for global economic growth suggests that demand for investment abroad will be somewhat restrained. On net, that combination of changes is projected to reduce capital flows to the United States relative to those in the 1990s or early 2000s, decreasing domestic investment and the amount of capital per worker and boosting rates of return. (Those developments are consistent with CBO’s projection that the U.S. trade deficit, the gap between its imports and its exports, will be narrower in the future as a percentage of GDP than it has been for the past few decades.)

11. 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 Lukasz Rachel and Thomas D. Smith, *Secular Drivers of the Global Real Interest Rate*, Staff Working Paper 571 (Bank of England, December 2015), <http://tinyurl.com/z6zqnb7> (PDF, 1.8 MB).

12. 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.

- The capital share of income—the percentage of total income that is paid to owners of capital—has been on an upward trend for the past few decades, and CBO projects that it will remain higher than its average of recent decades. Although that share is expected to decline somewhat over the next decade from its current, historically high level, the factors that appear to have contributed to its rise (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 to owners of capital will directly boost the return on capital and thus interest rates.
- The retirement of the baby-boom generation and slower growth of the labor force will reduce the number of workers in their prime saving years relative to the number of older people who are drawing down their savings, CBO projects. The result will be a decrease in the total amount of savings available for investment (all else being equal), which will tend to reduce the amount of capital per worker and thereby push interest rates up. (CBO estimates that this effect will only partially offset the positive effect on savings of increased income inequality, leaving a net increase in savings available for investment.)

CBO also has considered other influences on interest rates but has concluded that they will have relatively small effects.

In addition to its analysis of the factors listed above, CBO relies on information from financial markets in projecting interest rates for the long term. The current rate on 30-year Treasury bonds, for example, reflects market participants’ judgments about the path of interest rates on short-term securities for 30 years into the future. That market forecast informs CBO’s assessment of market expectations for the risk premium and for investment opportunities in the United States and abroad, and it points to considerably lower interest rates well into the future relative to those of recent decades.

Projections of Interest Rates. 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, theoretical models, and estimates in the literature. But the extent to which other factors will affect interest rates is more difficult to compute. A shift in preferences for low- rather than high-risk assets is not directly observable, for instance. And although the distribution of income is observable, neither models nor

empirical estimates offer much guidance for quantifying its effect on interest rates. Moreover, current interest rates are not a reliable indicator of investors’ expectations about interest rates over the long term, in part because maturities of most of the government’s outstanding debt securities are much shorter than the 30-year period that is the focus of CBO’s long-term projections. In light of those sources of uncertainty, CBO relied on economic models, the research literature, and other information to guide its assessments of the effects of various factors on interest rates over the long term.

The estimates and assumptions that underlie CBO’s extended baseline projections suggest a real interest rate on 10-year Treasury notes that averages about 1.9 percent over the 2016–2046 period. That rate is about 1.2 percentage points lower than the 3.1 percent average recorded for the 1990–2007 period, but it also implies that the real rate will gradually increase from its current unusually low level over the next three decades. In the final decade of the 30-year projection period, the rate is projected to average 2.2 percent.

The average interest rate on all federal debt held by the public tends to be somewhat below the rates on 10-year Treasury notes because interest rates are generally lower on shorter-term than on longer-term debt and because Treasury securities are expected to mature, on average, over periods of less than 10 years. The combination of CBO’s projections of the interest rates for assets of different maturities and the average maturity of federal debt for the period beyond CBO’s 10-year baseline leads to a 0.4 percentage-point difference between the rate on 10-year Treasury notes and the effective rate on federal debt. That difference is projected to average 0.8 percentage points over the next decade. The difference is larger over that period than is projected for later years because a significant portion of federal debt outstanding during that period was issued at the very low interest rates prevailing in the aftermath of the recession. (The average interest rate on all federal debt is projected to rise more slowly than the 10-year rate because only a portion of federal debt matures each year.) Thus, CBO projects, the average real interest rate on all federal debt held by the public (adjusted for the rate of increase in the CPI-U) will be about 1.4 percent for the 2016–2046 period.

The Social Security trust funds hold special-issue bonds that generally earn interest at rates that are higher than the average rate on federal debt. Therefore, in projecting the balances in the trust funds and calculating the present value of future streams of revenues and outlays for those

funds, CBO used an interest rate that averages 1.9 percent for the 2016–2046 period.¹³

Combining CBO’s projections of real interest rates with inflation, as measured by the growth of the CPI-U, yields projected nominal interest rates. CBO projects average nominal rates of 4.3 percent on 10-year Treasury notes and 3.7 percent on all federal debt held by the public for the 2016–2046 period.

Revisions to Projections of Interest Rates. The interest rate projections in this year’s long-term budget outlook are substantially lower than last year’s projections. The real rates on 10-year Treasury notes and the Social Security trust funds are projected to average 1.9 percent over the entire 30-year projection period and 2.2 percent in the final decade of the period. In particular, both rates are projected to be 2.2 percent in 2040 (the final year of the projection in *The 2015 Long-Term Budget Outlook*). Last year, after accounting for the effects of fiscal policy in the extended baseline, CBO projected both rates to be 2.6 percent in 2040.¹⁴

CBO’s downward revisions to its interest rate projections are rooted in several factors. Since last year CBO has revised upward its estimates of the risk premium and of the net inflow of foreign capital relative to GDP. Both changes led to a downward revision in projected interest rates and both are consistent with signals from financial markets that participants expect interest rates to remain low well into the future. In addition, a release last July of revised historical data from the Bureau of Economic

13. A present value is a single number that expresses a flow of future income or payments in terms of an equivalent lump sum received or paid at a specific point in time; the present value of a given set of cash flows depends on the rate of interest—known as the discount rate—that is used to translate them into current dollars.

14. These comparisons address the economic projections that incorporate the effects of the fiscal policies embodied in the extended baseline. Last year’s benchmark projections—that is, the projections consistent with the assumption of a constant ratio of debt to GDP and stable effective marginal tax rates beyond 2025—were different. In last year’s benchmark, the real rate on 10-year Treasury notes averaged 2.2 percent over the entire projection period and 2.3 percent in the later years. Although this year’s report does not use an economic benchmark, CBO estimated interest rates that are consistent with the assumption of a constant debt-to-GDP ratio and stable effective marginal tax rates beyond 2026. Those projections of 10-year Treasury note rates would be 1.7 percent over the 2016–2046 period, on average, and 1.8 percent in the later years. As a result, the comparable interest rates relative to last year’s benchmark projections are revised downward by about 0.5 percentage points.

Analysis led CBO to revise downward its estimate of the share of income that is generated by capital; the new data showed that the share was lower than reported previously.¹⁵ Finally, CBO expects TFP to grow more slowly relative to the growth experienced during the 1990–2007 period than it anticipated last year. The recent decline in the capital share and the slower expected growth in TFP both imply lower returns on capital and, in turn, lower interest rates.

Demographic Variables

In addition to influencing the overall performance of the economy, the size and composition of the U.S. population affects federal tax revenues and spending. Demographic projections incorporate estimated rates of fertility, immigration, and mortality, and the changes in those variables ultimately will affect the size of the labor force and the number of beneficiaries for such federal programs as Social Security and Medicare.

CBO anticipates that the annual growth rate of the U.S. population will decline gradually from about 0.8 percent in 2016 to about 0.5 percent in 2046 and that the total population will increase from 328 million at the beginning of 2016 to 400 million in 2046. Those values are somewhat below the estimates published in last year’s report.

The population is projected not only to grow more slowly but also to become older, on average, than in the past. Because the elderly share of the population is growing and the working-age share is shrinking, the nation will face growing retirement and health care costs as a larger portion of the population receives Social Security and Medicare benefits while a smaller segment pays into the trust funds that support those federal programs.

Fertility

CBO estimates a total fertility rate of 1.9 children per woman for the 2016–2046 period.¹⁶ (That rate is the average number of children that a woman would have in her lifetime if, at each age of her life, she experienced the birthrate observed or assumed for that year and if she

15. See Stephanie H. McCulla and Shelly Smith, “The 2015 Annual Revision of the National Income and Product Accounts,” *Survey of Current Business*, vol. 95, no. 8 (August 2015), pp. 1–31, <http://go.usa.gov/x3Fe3> (PDF, 1.5 MB).

16. Although CBO projects a total fertility rate, in its long-term model, the likelihood that a particular woman will have a child depends on such factors as that woman’s education, marital status, immigration status, and childbearing history.

survived her entire childbearing period.) Fertility rates often decline during recessions and rebound during recoveries. However, after the 2007–2009 recession, the U.S. fertility rate (which in 2007 was 2.1) dropped and has remained below 1.9. CBO’s projection is consistent with that recommended by the Social Security Advisory Board’s 2015 Technical Panel on Assumptions and Methods and slightly below the average rate of 2.0 that CBO projected last year for the 2015–2040 period.¹⁷ The change in projected fertility is the largest factor in this year’s projection of slower population growth.

Immigration

CBO’s immigration projections match those underlying its 10-year baseline through 2026. After 2026, net annual immigration (which accounts for all people who either enter or leave the United States in any year) is projected to decline slowly until 2036, when it is expected to equal the rate projected by the Census Bureau.¹⁸ (CBO anticipates that net annual immigration will continue to match the Census Bureau’s projections thereafter.) On that basis, the rate of net annual immigration to the United States is projected to be 4.0 per thousand people in the U.S. population in 2026 and 3.7 per thousand people in 2046. Net annual immigration is anticipated to rise from 1.4 million people in 2026 to 1.5 million people in 2046. The current projection is higher than the annual net immigration rate of 3.2 per thousand people after 2025 that CBO used in *The 2015 Long-Term Budget Outlook*. CBO increased its projection for the period after 2026 to be more consistent with the trend it anticipates for the next 10 years.

Mortality

The mortality rate, which is the number of deaths per thousand people, has generally declined in the United States for at least the past half century. During that period, the mortality rate has generally improved more quickly for younger people than for older people. In particular, a recent review of the data by CBO suggests that the differences in relative improvements in mortality exhibited by various age groups are significant and likely

to continue. For example, mortality rates for people below 15 years old declined by about 80 percent between 1950 and 2012, an average drop of more than 2½ percent per year, whereas mortality rates for people over the age of 80 declined by an average of less than 1 percent per year over the same period. CBO projects that mortality rates for each five-year age group will continue to decline at the average pace experienced from 1950 through 2012. In contrast, in *The 2015 Long-Term Budget Outlook*, CBO projected that the rate of decline would be the same for all ages and both sexes. This year’s projections show a slower rate of decline in mortality rates for people in older groups than for younger, but no difference by sex.

CBO’s projections indicate an average life expectancy at birth of 82.3 years in 2040, compared with 79.2 years in 2016.¹⁹ Similarly, CBO projects that life expectancy at age 65 in 2040 will be 21.2 years, or 1.8 years longer than life expectancy at age 65 in 2016.²⁰ The life expectancies projected for 2040 this year are a bit shorter than those reported last year: In last year’s report, life expectancy at birth and at age 65 in 2040 was projected to be 82.6 years and 21.8 years, respectively.

After projecting average mortality rates for men and women in each age group, CBO incorporates differences in those rates on the basis of marital status, education, and lifetime household earnings. (For people under 30, the mortality projections account for age and sex only.) CBO projects a greater life expectancy for people who are married, have more education, and are in higher income groups.²¹

17. See 2015 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (September 2015), p. 9, <http://go.usa.gov/cJYR5> (PDF, 3.4 MB); and Congressional Budget Office, *The 2015 Long-Term Budget Outlook* (June 2015), www.cbo.gov/publication/50250.

18. See Census Bureau, “Population Projections, 2014 National Population Projections: Summary Tables,” Table 1 (accessed July 8, 2016), <http://go.usa.gov/x33DB>.

19. 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.

20. CBO projects that life expectancy in 2090 will be 87.3 years at birth and 24.6 years at age 65. CBO’s projections of life expectancies are longer than those of the Social Security trustees (85.9 and 23.6 years, respectively) but shorter than the projections (88.3 and 25.3 years, respectively) recommended in the report of the 2015 Technical Panel on Assumptions and Methods, *Report to the Social Security Advisory Board* (September 2015), pp. 13–20, <http://go.usa.gov/cJYR5> (PDF, 3.4 MB).

21. For more information about mortality differences among groups with different earnings, see 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.