



# 2015

## Technical Panel on Assumptions and Methods

REPORT TO THE  
SOCIAL SECURITY ADVISORY BOARD

SEPTEMBER 2015

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NOTE: In a previous printing of this report, the data in Table 5 (p.26) were incorrect. This version of the report contains the corrected figures.

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The Panel of expert actuaries, economists and demographers appointed by the Social Security Advisory Board is charged with providing technical assistance to the Board by reviewing the assumptions specified by the Board of Trustees of the Old-Age and Survivors Insurance Trust Fund and the Disability Insurance Trust Fund and the methods used by the Social Security actuaries to project the future financial status of the programs. The Panel shall deliver a written report to the Advisory Board by September 2015.

Specifically the Panel is asked to:

1. Review the key economic and demographic assumptions.
2. Review and assess current projection methodologies.
3. Review ways to improve the presentation of key concepts in the *Trustees Report* so as to make them more accessible and informative to the public.
4. Review in particular:
  - a. The impact of the enactment of the Affordable Care Act on factors affecting OASDI financing such as labor force participation, retirement and disability claiming, and the earnings to compensation ratio.
  - b. Recent developments in labor force growth, participation rates, labor productivity, and dispersion in earnings.
  - c. The implications of trends in family formation on benefit projections and labor force trends.
5. Review and assess the status of the recommendations of previous Technical Panels appointed by the Advisory Board.

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## Introduction and Acknowledgments

The 2015 Technical Panel on Assumptions and Methods was convened by the Social Security Advisory Board (SSAB) in November 2014 to review the assumptions specified by the Board of Trustees and to evaluate the methods used by the Office of the Chief Actuary to project the future financial status of the Old-Age and Survivors Insurance and Disability Insurance Trust Funds. We have worked diligently over the past year, both individually and collectively, to fulfill this mandate.

The Technical Panel held a closed door planning meeting in November, five public meetings at the offices of the Social Security Advisory Board in Washington, DC, and one public meeting at the National Bureau of Economic Research in Cambridge MA, on the following dates:

- November 21, 2014
- December 12, 2014
- January 16, 2015 (Cambridge, MA)
- February 13, 2015
- March 13, 2015
- May 7–8, 2015
- June 19, 2015

We benefited greatly from the presentations made at those meetings and from the questions and comments of those in attendance and the ensuing discussion.

The staff in the Social Security Administration's Office of the Chief Actuary attended all of our public meetings, made several presentations to the Technical Panel, answered countless questions, fielded many requests for data, and ran all of the projections presented in this report. We appreciate the tireless support of Stephen Goss (Chief Actuary), Alice Wade, Eli Donkar, Robert Weathers, Jason Schultz, Michael Morris, and Karen Glenn.

Robert Reischauer, a public trustee of the Social Security Trust Fund graciously met with the Technical Panel and

attended most meetings. We appreciate his support and insights.

Our discussions were greatly informed by outside experts who participated in our meetings. On the difficult topic of mortality projections, our thinking was shaped by Samuel Preston and we thank Gary King and his co-authors Konstantin Kashin and Samir Soneji for their presentation. On the equally complex topic of disability, Jeffrey Liebman's insights were invaluable. On interest rates, John Campbell offered useful perspective. On long-term economic growth, Jim Stock provided helpful guidance.

In addition to those named above, we are grateful to the many individuals who spoke informally with members of the Technical Panel over the past year. We would also like to thank the entire staff of the Social Security Advisory Board for their excellent support.

Finally, Joel Feinleib, the Technical Panel's executive director and the Social Security Advisory Board's chief economist, has been "on loan" from the SSAB to support the Technical Panel. He has been a behind-the-scenes catalyst for our efforts, providing both sound guidance on details large and small and offering invaluable historical perspective on the deliberations of previous Technical Panels. Joel is a gem.

As the Chair, I am extremely grateful to the panelists for their service. We had an exceptionally talented group. Each individual is a star in his or her own right so that the different perspectives and sheer intellectual horsepower that everyone offered made for an exciting process. The key ingredient that made it work was everyone's willingness to compromise to present a consensus report.

Please note that this report reflects the views of the Technical Panel members and does not necessarily reflect the views of any organizations with which they are affiliated.

*Alicia H. Munnell, Chair*

The 2015 Technical Panel on Assumptions and Methods was created by the Social Security Advisory Board in September 2014 to review the assumptions specified by the Board of Trustees and to evaluate the methods used by the Office of the Chief Actuary (OCACT) to project the future financial status of the Old-Age and Survivors Insurance and Disability Insurance (OASDI) Trust Funds.

Social Security's actuaries and Trustees have an enormously difficult task—projecting demographic and economic developments over the next 75 years and conveying to Congress and the public, in a comprehensible fashion, the health of the program and the associated risks. This Panel recognizes the immense challenges involved and, after reviewing the assumptions specified by the Trustees and the methods used by the actuaries, concludes that the assumptions and methodologies are basically sound. That said, the Panel makes a number of recommendations that it believes would improve the process. Before discussing the individual recommendations, the Panel would like to make an over-arching recommendation that the Trustees periodically compare their past projections—both for the individual assumptions and the program's overall finances—to actual outcomes in order to inform OCACT, the Trustees, and users of the Trustees' annual reports about the accuracy of the projections.

The following discussion begins with the demographic assumptions, then turns to the economic assumptions, and concludes with issues of presentation. The intermediate (Alternative II) set of assumptions represents the Trustees' best estimate for future experience, while the low-cost (Alternative I) and high-cost (Alternative III) sets of assumptions represent more and less favorable scenarios, respectively, from the perspective of program financial balance.

### ■ I. Demographic Assumptions and Methods

Since Social Security operates basically on a pay-as-you-go basis, the number of people paying into the system compared with the number of people receiving benefits is a key component of program cost. Each of the demographic assumptions considered by the Panel affects both of these numbers. The contributor population includes current workers, future workers (fertility), and immigrants (immigration). The beneficiary population is influenced by

how long people live (mortality) and how healthy they are (disability). The Panel's recommendations regarding the assumptions for these variables argue for a slight decline in the fertility assumption; a significant increase in assumed future immigration; a larger reduction in mortality rates—that is, a larger increase in life expectancy than current Trustees' projections; and a reduction in the rate at which disability recipients are expected to leave the rolls.

#### Fertility

Shifts in fertility impact the relative number of workers and beneficiaries in the Social Security system, which in turn affects the relative size of revenues and costs. In the short term, roughly the first 20 years after a shift, the effect is quite small since it only affects the size of the potential dependent beneficiary population. In the medium term, 20–65 years after a shift, fertility patterns will affect the number of workers paying into the system. In the long-term, 65 or more years, the size of future birth cohorts affects the number of old-age beneficiaries. The large increase in fertility rates in the post-war period followed by the sharp reduction and flattening out of fertility rates in subsequent decades to the present explain in large measure the changing fortunes of the OASDI trust funds being experienced now. As the large birth cohorts born during the baby boom enter retirement, relatively fewer workers will support relatively more beneficiaries, raising program costs sharply. Because fertility can have a major impact on financing, it is important that the high-cost and low-cost assumptions fully encompass the full range of plausible outcomes.

**Assumption Recommendation.** The Technical Panel recommends reducing the intermediate total fertility rate (TFR) assumption from 2.00 to 1.90. This Panel agrees with previous Technical Panels that asymmetry in the range between the intermediate and low-fertility and high-fertility values is appropriate. The Technical Panel recommends that, from 2025 on, the low-cost TFR be lowered from 2.2 to 2.1, and the high-cost TFR be lowered from 1.8 to 1.6.

#### Mortality

No other assumption has been the subject of a more persistent and unresolved disagreement between the Trustees and successive Technical Panels than that of the assumed ultimate rate of improvement in mortality rates. Five successive Panels in 1995, 1999, 2003, 2007, and 2011 argued that the Trustees were assuming ultimate rates of



mortality improvement below historical averages and that the Trustees' rationale for those lower rates was unconvincing. Each successive Panel expressed its recommendations in a slightly different way—for example, with and without an age gradient or with slower or faster convergence from initial to ultimate rates. Each used a slightly different method to reach its conclusion, although all employed some manner of extrapolation from past trends. Yet, all recommended the ultimate rate of mortality improvement be raised. The last three recommended that the use of a by-cause method of projection be discontinued.

The Technical Panel has four assumption recommendations:

**Assumption Recommendation 1.** The Technical Panel recommends increasing the rate of mortality improvement such that the ultimate average percentage reduction in age-sex-adjusted central death rates is 1.0 percent during the last 50 years of the projection horizon. This recommended rate is significantly above the Trustees' currently assumed rate of 0.71 percent over the period 2039–2089. The Panel's recommendation would result in a projected unisex life expectancy at birth in 2090 of 88.3 years, and a life expectancy at age 65 in 2090 of 25.3 years, compared to 85.9 and 23.6 respectively assumed in the 2015 *Trustees Report*.

**Assumption Recommendation 2.** The Technical Panel recommends continuing to apply the same rate of ultimate mortality improvement for both males and females (as the Trustees currently do).

**Assumption Recommendation 3.** Retain the assumption that the projected mortality improvement rate varies by age and declines at older ages, as observed in historic data.

**Assumption Recommendation 4.** The Technical Panel recommends increasing the low-cost average mortality improvement rate from 0.4 percent to 0.5 percent and the high-cost rate from 1.2 percent to 1.5 percent.

The Technical Panel has three recommendations regarding methodology of mortality projections:

**Method Recommendation 1.** The Technical Panel recommends retaining the current mortality model that involves separate projections by cause of death.

**Method Recommendation 2.** The Technical Panel recommends investigating the utility of alternative approaches to projecting mortality and periodically publishing how their results compare to the current model. In particular, the Panel recommends conducting research into methods that formally incorporate drivers of mortality, such as smoking and obesity, and into methods that take account of cohort effects.

**Method Recommendation 3.** The Technical Panel recommends investigating alternative methods for establishing a starting point for the projections and for the process of

transitioning from the current period to the ultimate rates of mortality improvement.

## Immigration

The Technical Panel acknowledges that immigration is a volatile, unpredictable, poorly-understood, and increasingly politically-driven process, and that the long-range projections of immigration required of the Trustees therefore are exceptionally challenging. At the same time, the Panel recognizes that methods and assumptions about future U.S. immigration are important for the overall usefulness of the Trustees' long-range projections. With these realities in mind, the Technical Panel offers three recommendations.

**Assumption Recommendation 1: Net Immigration.** The Technical Panel recommends that the Trustees raise their intermediate assumption for net total immigration from an average of 1,155,000 in the 2015 *Trustees Report* to 1,298,000. And the Panel recommends that the low-cost and high-cost assumption be increased from an average of 1,465,000 to 1,655,000 and from 850,000 to 960,000, respectively. These recommendations were derived by averaging together two different sets of projections—one from the Trustees and one from the Census Bureau—that move in divergent directions. The Panel acknowledges that this procedure is not an acceptable way to create projections. Therefore, we urge OCACT and the Census Bureau to work together to develop a set of projections that reflects the Panel's judgment that the level of net total immigration is more likely to rise than decline.

The Trustees intermediate projections assume declining net immigration over the projection period. In contrast, the Panel concludes that net immigration is more likely to increase for three reasons. First, the absence under current law of numerical limits on legal permanent residence (LPR) visas for immediate family of U.S. citizens likely understates the number of family members who will obtain LPR status. Second, the Trustees' projections of legal emigration appear to be unduly influenced by outdated Census data that may overstate current emigration rates. And, third, the Trustees' assumptions lead to an improbably large decline in "net other immigration."

**Assumption Recommendation 2: Executive Actions.** The Technical Panel recognizes the inherent difficulties associated with any treatment of "executive actions" in long-range projections. The Trustees decided in their 2015 report to treat both the 2012 and 2014 executive actions as "current law" in their projections. The Technical Panel would have included the 2012 action but would have deferred inclusion of the more recent and more significant executive actions announced in late 2014. The Panel's understanding is that the 2012 executive actions have already been implemented, but that the 2014 executive actions are being actively challenged in both the courts and in Congress, and that their

implementation currently is suspended under a preliminary injunction issued by a Federal District Court.<sup>1</sup> These are hard calls, however, and the Technical Panel accepts the Trustees' decision. In the treatment of any executive action, the Technical Panel urges the Trustees to modify their overall projections to reflect the positive feedbacks on "legal immigration."

**Presentation Recommendation.** The Technical Panel recommends that the Trustees present graphical representations of all of the assumed trajectories included in its immigration projections, in addition to the data tables included in past *Trustees Reports*. Such graphical presentations would provide readers with a clearer understanding of the Trustees' assumptions and their effects upon the immigration projection outcomes. Specifically, such graphs would clearly show that the downward trajectory of total net immigration that appears in the Trustees' 2015 intermediate projection is being driven primarily by assumptions of future declines in "net other immigration."

## Disability

The secular rise in Social Security Disability Insurance (SSDI) prevalence (the ratio of all DI beneficiaries to the insured non-recipient population) over the past three decades stems from three distinct sources—rising incidence (the ratio of new beneficiaries to non-beneficiaries in a given year); population aging; and female catch-up in insurance coverage and incidence. These drivers of change to SSDI prevalence are not likely to recur in the years ahead, meaning that a further rise in SSDI prevalence is not inevitable. Historical experience accumulated since the prior Technical Panel regarding DI prevalence, incidence, allowance rates, and percent insured, all point to substantially slower program growth.

**Assumption Recommendation 1.** The Technical Panel accepts the Trustees' current assumptions regarding DI incidence, specifically, an intermediate age-sex-adjusted incidence rate of 5.4 awards per 1,000 exposed, with low- and high-cost values of 4.3 and 6.5 awards per 1,000 exposed. Because the incidence rate appears to be undergoing rapid and, perhaps, unexpected changes, it will be important to closely monitor its evolution as experience accumulates.

**Assumption Recommendation 2.** The Technical Panel recommends lowering the intermediate, high-cost, and low-cost assumptions for the DI recovery rate from 10.4 to 10.1 recoveries per 1,000. We recommend symmetric reductions to the low- and high-cost rates: from 12.6 and 8.3 recoveries per 1,000 respectively to 12.3 and 8.0 per 1,000.

**Assumption Recommendation 3.** Accounting for the stabilization of the disability composition of the SSDI population and the adjustments to mortality estimates incorporated

by the Trustees since the prior Technical Panel's report, this Technical Panel is comfortable with the Trustees' current mortality assumptions for DI beneficiaries.

**Method Recommendation 1.** Given the complex and rapid changes in labor force participation rates among both sexes, and the difficulty of clearly distinguishing the short- and medium-run effects of the Great Recession from the long-run effects of shifting labor demand and evolving social norms and preferences (as discussed in Chapter 3), the Technical Panel recommends continued close study of the evolution of insured rates for both sexes. Given this uncertainty, and its consequences for program evolution, the Technical Panel further recommends maintaining a fairly wide confidence band around these estimates.

**Method Recommendation 2.** The Technical Panel recommends exploring in greater depth the recent changes in DI allowance rates to better understand whether recent declines are due entirely to cyclical factors (as per OCACT Actuarial Note #153), or whether other programmatic factors may be at work.

## ■ II. Economic Assumptions and Methods

The number of people working and contributing to Social Security depends on the labor force participation rate and the unemployment rate. Among those who are working, a key variable affecting the program's finances is the growth rate in real earnings. Because an individual's earnings are only subject to taxation only below a specific dollar threshold, the distribution of earnings in the economy determines the percentage of total earnings that is taxable. Other economic variables affecting the program's finances include nominal interest rates—components of which are the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) plus the real interest rate. Nominal interest rates affect projections of the fiscal status of the program, since the Trust Funds' bonds are indexed to market rates and nominal interest rates are used for discounting future cash flows when computing summary measures of system finances.

### Labor Force Participation Rate

Higher labor force participation, for any given unemployment rate, means that more people are working and paying into the Social Security system. For some people, added years of work will lead to higher benefit payments, but this will not be the case for everyone. Thus, the net effect of increased labor force participation generally is to reduce the shortfall in the actuarial balance. Because any increase

<sup>1</sup> As of August 5, 2015.

in benefits will lag the increase in revenues, this effect is especially noticeable in the near term.

The Technical Panel has four recommendations:

**Method Recommendation 1.** The Technical Panel recommends that in developing the labor force projections, the Trustees should allow for likely future increases in the educational attainment of the population. One way, but not the only way, to do this would be to assume that U.S. educational attainment will converge over time to the higher levels of education observed in a country such as Canada. Higher levels of education are likely to increase labor force participation rates, raising the level of labor force participation in the projections.

**Method Recommendation 2.** The Technical Panel recommends that the Trustees explore possible methods for incorporating labor-demand factors into the projections. Countries that have experienced large changes in the relative size of different age cohorts could inform this exploration.

**Method Recommendation 3.** The Technical Panel recommends that the Trustees use alternative assumptions about educational attainment and, perhaps more ambitiously, labor demand to produce a more meaningful variation in labor force participation projections for incorporation in the low-cost and high-cost scenarios.

**Presentation Recommendation.** The Technical Panel recommends that information be included in the Trustees' Report that would allow the reader to assess the sensitivity of the projected Trust Fund balances to variations in realized labor force participation rates. One way, but not the only way, to do this would be to consider labor force participation rates that are 10 percent higher or 10 percent lower than those incorporated in the intermediate projection. These variations could be assumed to apply to the entire population or only to individuals in a certain age range.

## Unemployment Rate

In the Trustees' projections, lower unemployment is associated with a net improvement in Social Security's finances, as the increased number of workers raises system revenues by more than it raises future benefits.

**Assumption Recommendation.** The Technical Panel recommends no change in the ultimate, long-run, age-sex-adjusted unemployment rate of 5.5 percent assumed in the 2015 *Trustees Report* for the intermediate cost scenario. The Panel also recommends retaining the assumed values of 4.5 percent and 6.5 percent in the low-cost and the high-cost scenarios.

## Real Earnings Growth Rate

The rate of real earnings growth is a crucial component of the Trustees' projections. Under current law, initial benefits for each successive wave of retirees are determined by taking the highest 35 years of earnings indexed to the growth in average annual earnings up to age 60 and nominal earnings thereafter.<sup>2</sup> Once the benefit is determined at 62, it is indexed to inflation based on the CPI-W. An increase in real earnings will raise both taxable payroll and the benefits of each cohort of new retirees, but the benefits of existing retirees will be unaffected. In effect, the growth in total benefits will lag behind the rise in revenues. Thus, faster growth in real earnings will lead to a significant increase in the actuarial balance and slower growth to a significant reduction.

The central driver of growth in real earnings is growth in labor productivity. The *level* of average real earnings is linked to the level of labor productivity (the first term to the right of the equal sign in the equation below) through four mediating factors (the remaining terms to the right of the equal sign in the equation): 1) labor compensation as a share of total GDP; 2) earnings as a share of labor compensation; 3) average hours per worker; and 4) the ratio of the GDP price deflator to the CPI:

$$\frac{\text{Earnings/CPI}}{\text{Employment}} = \frac{\text{GDP/PGDP}}{\text{Hours}} \times \frac{\text{Compensation}}{\text{GDP}} \times \frac{\text{Earnings}}{\text{Compensation}} \times \frac{\text{Hours}}{\text{Employment}} \times \frac{\text{PGDP}}{\text{CPI}}$$

Using the relationship in this equation, the Trustees then determine the average annual change for each indicator, which allows them to compute real earnings growth.

The Technical Panel has considered both the Trustees' 2015 assumption for productivity growth and its assumptions for the growth in the four mediating factors and sees no compelling reason to question the conclusions reached by the Trustees for these variables.

**Assumption Recommendation.** The Technical Panel recommends retaining the Trustees' 2015 ultimate assumption for average annual real earnings growth of 1.17 percent. The Technical Panel also recommends retaining the low-cost and high-cost assumed growth rates of 1.80 and 0.55 percent. Similarly, the Technical Panel recommends no changes to the assumptions for the underlying components that determine real earnings growth.

## Taxable Share of Total Earnings

Only earnings below the contribution and benefit base (also known as the taxable maximum), set at \$118,500 per year in 2015, are subject to OASDI payroll taxes and count

<sup>2</sup> Both Social Security's income and benefits are linked to total covered earnings, which include both wages and net earnings from self-employment.

toward Social Security benefits.<sup>3</sup> The taxable ratio refers to the fraction of total earnings in OASDI-covered jobs below this threshold and therefore subject to payroll tax. This ratio, which varies with the dispersion of earnings, is important for Social Security costs; a lower ratio has an adverse effect on Social Security's finances.

**Assumption Recommendation.** The Technical Panel recommends lowering the ultimate level for the taxable share of covered earnings from 82.5 percent in the 2015 *Trustees Report* to 82.2 percent. The Panel also recommends expanding the range of uncertainty around the taxable ratio given that it could continue to shift in the coming years. The Technical Panel recommends keeping the low-cost value at 84.0 percent, as the Trustees' currently assume, and lowering the high-cost value from 81.0 percent to 79.0 percent, a range that is modestly asymmetric around the recommended intermediate value.

**Method Recommendation.** The Technical Panel recommends that OCACT continue to study the ongoing fluctuations in the taxable ratio to develop a more precise understanding of its underlying causes and hence a firmer basis for projecting its trajectory.

## Inflation and Interest Rates

Realized and expected rates of inflation, real interest rates, and nominal interest rates are important for projecting the operations of the Trust Funds and the Social Security program's fiscal status. The Trust Funds are invested in special-issue Treasury securities with initial rates indexed to nominal market interest rates. In addition, nominal interest rates are used for discounting future cash flows when computing present values for various summary measures of system finances reported in the annual *Trustees Report*.

**Assumption Recommendation 1: Inflation.** The Technical Panel recommends that the Trustees lower their intermediate assumption for inflation from 2.7 percent to 2.5

percent. With a new intermediate estimate of 2.5 percent for CPI-W, and because the range of inflation surprises appears to be larger on the high side than the low side, the Panel recommends that the low-cost and high-cost assumptions be 3.5 percent and 1.8 percent, respectively.

**Assumption Recommendation 2: Real Interest Rate.** The Technical Panel recommends that the Trustees lower their intermediate assumption for the real interest rate from 2.9 percent to 2.5 percent. The Panel recommends that the low-cost and high-cost assumptions for real rates should be 3.0 percent and 2.0 percent, respectively.

**Assumption Recommendation 3: Nominal Interest Rate.** Consistent with the recommended changes to inflation and the real interest rate, the Technical Panel recommends that the Trustees should lower their intermediate assumption for the nominal interest rate from 5.6 percent to 5.0 percent. The Panel recommends that the low-cost and high-cost assumptions for nominal rates should be 6.5 percent and 3.8 percent respectively.

**Method Recommendation 1.** As inflation, real interest rates, and nominal interest rates are linked theoretically and empirically, the Technical Panel recommends that they be analyzed and discussed together, not separately.

**Method Recommendation 2.** In addition to reporting comparisons of historical data and projections by other organizations, the Technical Panel believes that the Trustees and OCACT should also consider: 1) evidence from surveys of professional forecasters; and 2) evidence inferred from market outcomes.

## Summary of Recommended Changes in Assumptions and Impact on System Finances

Table 1 compares the intermediate, low-cost, and high-cost assumptions in the 2015 *Trustees Report* with those proposed by the Technical Panel. Table 2 shows the impact of the Panel's recommendations on the 75-year actuarial balance; on the deficit in the 76<sup>th</sup> year (2090); and on the year that the combined OASDI trust funds reserves are projected to be depleted.

<sup>3</sup> This limit changes annually with changes in the national Average Wage Index, although it does not rise in years when there is no Social Security cost of living increase, such as between 2009 and 2011.

Table 1. Summary of 2015 Technical Panel Assumption Recommendations

Assumption	(ultimate assumption)		
	Intermediate	Low cost	High cost
<b>Fertility rate</b>			
2015 <i>Trustees Report</i> (from 2027–2089)	2.0	2.2	1.8
<b>2015 Technical Panel (from 2025–2089)</b>	<b>1.9</b>	<b>2.1</b>	<b>1.6</b>
<b>Mortality improvement rate<sup>4</sup></b>			
2015 <i>Trustees Report</i>	0.71%	0.40%	1.02%
<b>2015 Technical Panel</b>	<b>1.00%</b>	<b>0.50%</b>	<b>1.50%</b>
<b>Net immigration (average 2015–2089, in 1000s)</b>			
2015 <i>Trustees Report</i>	1,155	1,465	850
<b>2015 Technical Panel</b>	<b>1,298</b>	<b>1,655</b>	<b>960</b>
<b>Disability</b>			
Incidence rate (per 1000 exposed)			
2015 <i>Trustees Report</i>	5.4	4.3	6.5
<b>2015 Technical Panel</b>	<b>5.4</b>	<b>4.3</b>	<b>6.5</b>
Recovery rate (per 1000 exposed)			
2015 <i>Trustees Report</i>	10.4	12.6	8.3
<b>2015 Technical Panel</b>	<b>10.1</b>	<b>12.3</b>	<b>8.0</b>
<b>Unemployment rate</b>			
2015 <i>Trustees Report</i>	5.5%	6.5%	4.5%
<b>2015 Technical Panel</b>	<b>5.5%</b>	<b>6.5%</b>	<b>4.5%</b>
<b>Real earnings growth rate<sup>5</sup></b>			
2015 <i>Trustees Report</i>	1.17%	1.80%	0.55%
<b>2015 Technical Panel</b>	<b>1.17%</b>	<b>1.80%</b>	<b>0.55%</b>
<b>Taxable share of total earnings</b>			
2015 <i>Trustees Report</i>	82.5%	84.0%	81.0%
<b>2015 Technical Panel</b>	<b>82.2%</b>	<b>84.0%</b>	<b>79.0%</b>
<b>CPI-W growth rate</b>			
2015 <i>Trustees Report</i>	2.7%	3.4%	2.0%
<b>2015 Technical Panel</b>	<b>2.5%</b>	<b>3.5%</b>	<b>1.8%</b>
<b>Real interest rate</b>			
2015 <i>Trustees Report</i>	2.9%	3.4%	2.4%
<b>2015 Technical Panel</b>	<b>2.5%</b>	<b>3.0%</b>	<b>2.0%</b>

Sources: 2015 *Trustees Report* and Technical Panel recommendations.

<sup>4</sup> The mortality improvement rate is the ultimate average annual percentage reduction in the total age-sex-adjusted death rate (2039–89).

<sup>5</sup> The real wage growth assumption is derived from the sum of the five separate assumptions described above. The Technical Panel recommends no change in the constituent assumptions, so they are not displayed in Table 1.



Table 2. Effects of 2015 Technical Panel Assumption Recommendations on OASDI Actuarial Balance (as a Percent of Taxable Payroll)

	75-year actuarial balance	2090 deficit	Year of fund depletion
<b>2015 Trustees Report</b>	<b>-2.68%</b>	<b>-4.69%</b>	<b>2034</b>
Change due to:			
Fertility rate	-0.23%	-0.72%	2034
Mortality improvement rate	-0.30%	-0.73%	2034
Net immigration	0.06%	0.19%	2034
Disability	0.00%	0.00%	2034
Taxable share of total earnings	-0.03%	-0.02%	2033
CPI-W growth rate	-0.04%	-0.07%	2034
Real interest rate	-0.17%	0.00%	2033
<b>2015 Technical Panel</b>	<b>-3.42%</b>	<b>-6.08%</b>	<b>2033</b>

Note: In order to project the results of the Panel's recommended rate of mortality improvement of 1 percent per year, OCACT increased each of the Trustees' age-sex-cause specific rates of decline by 58 percent (multiplied by 1.58). The Panel as a whole did not have the time to pursue a recommendation of a specific age gradient, although at least one Panel member thought that the age gradient should be more gradual than the Trustees assume through age 84.

Source: Office of the Chief Actuary's calculations of the impact of Technical Panel recommendations.

### III. Presentation

#### Presentation of Uncertainty

Past Technical Panels have consistently recommended improving the analysis and presentation of uncertainty about long-run Social Security finances in the *Trustees Reports*. With help from the Office of the Chief Actuary (OCACT), the Trustees have made significant progress toward these recommendations, including the development of stochastic modeling capabilities and changes in the presentation of data. The 2015 Technical Panel makes five recommendations that would continue the trend in improvement in the presentation of uncertainty.

**Presentation Recommendation 1.** The Technical Panel recommends that for the key individual assumptions the Trustees set and disclose standards for the selection of low-cost and high-cost alternative assumptions used to demonstrate the program's financial sensitivity to each assumption. Acceptable standards would ensure that the alternative assumptions are plausible and comparable. For example, the Trustees could conceptually target the 10<sup>th</sup> and 90<sup>th</sup> percentile range of long-run averages for each assumption.

**Presentation Recommendation 2.** The Technical Panel recommends referring to the low-cost and high-cost

alternatives as the "Higher Trust Fund Balance" and "Lower Trust Fund Balance" alternatives, respectively.

**Presentation Recommendation 3.** The Technical Panel recommends the use of plausible integrated scenarios to illustrate these Higher and Lower Trust Fund Balance estimates of the program's long-run financial status. These scenarios would replace the low-cost and high-cost variants as currently presented in the *Trustees Report*.

**Presentation Recommendation 4.** The Technical Panel recommends periodic comparison of past key assumptions, cost rate projections, and taxable payroll projections to their realized values 5, 10 and 20 years later.

**Presentation Recommendation 5.** The Technical Panel recommends increasing the prominence of summary data about the uncertainty of projections. More specifically, the Panel recommends:

- Summarizing the effects of uncertainty about individual key assumptions in the Overview to the *Trustees Report*;
- Including summary data from stochastic analyses where uncertainty is discussed; and
- Summarizing large data sets disclosed in the body of the report in a way that provides analytical insight and disclosing the complete data sets in the appendices to the report or in online databases.

## Illustrating Scheduled Benefits Relative to Earnings

From 1989 to 2000, Social Security reported benefits as a percentage of final earnings for three types of “steady earners.” Low, medium, and high earners were assumed to earn 45 percent, 100 percent, and 160 percent respectively of the Average Wage Index (AWI) in each year, and benefits were illustrated relative to the final year of these steady earnings. With steady earnings tracking AWI, this ratio was equivalent to using wage-indexed career-average earnings in the denominator of the benefits-to-earnings ratio. From 2002–2013, the Trustees replaced the steady earnings assumptions with assumptions that were more representative of actual earnings patterns called “scaled earners.”

The 2014 and 2015 *Trustees Reports* do not provide any measure of benefits as a percentage of earnings. Instead, they showed scheduled benefit amounts upon retirement at the full retirement age (FRA) and at age 65, calculated under intermediate assumptions for various hypothetical scaled earners attaining age 65 in 2014 and subsequent years (see table V.C7 in the 2014 and 2015 *Trustees Reports*). Table V.C7 also shows the National Average Wage Index in constant dollars (in the year of the published Report) from which it is possible to compute some of the percentage-of-earnings measures provided in prior reports.

**Presentation Recommendation.** The Technical Panel recommends that the *Trustees Report* provide information on the relationships between benefits and earnings for three purposes. First, these ratios indicate an effect of changes

to the benefit formula on the history of the program and the projection of its financial status. Second, measured on a lifetime basis, these ratios show the impact of improving mortality on the cost of individual benefits. Third, these ratios provide insights to workers, employers and policymakers about the role of Social Security benefits in individuals’ financial planning or employers’ retirement plan design.

**Method Recommendation.** The Technical Panel recommends that OCACT undertake research on this subject for several purposes, including: 1) to help inform some of the measures that we recommend be included in the *Trustees Report*; 2) to show benefits relative to earnings for a sample of actual workers, following up the work in Actuarial Note 155; and 3) to show ratios involving auxiliary benefits.

## Measures of Long-Run Financial Sustainability

**Presentation Recommendation 1.** The Technical Panel recommends enhancing the discussion of very long-run financial sustainability through: 1) reporting the cost-revenue gap in the 75<sup>th</sup> year in proportion to revenue and GDP; 2) reporting whether this gap is increasing, stable or decreasing; 3) explicitly discussing the financial consequences of any program features that are not expected to fully emerge during the 75-year valuation period; and 4) providing a more extensive discussion of sustainable solvency than is currently included in the *Trustees Reports*.

**Presentation Recommendation 2.** At the same time that the above changes are made, the Technical Panel recommends eliminating the infinite horizon metric from the *Trustees Report*.

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## Chapter 1. Demographic Assumptions and Methods

### ■ 1.1 Fertility

Shifts in fertility impact the relative number of workers and beneficiaries in the Social Security system, which affects the relative size of revenues and costs. In the short term, roughly the first 20 years after a shift, the effect is quite small since it only affects the size of the potential dependent beneficiary population. In the medium term, 20–65 years after a shift, fertility patterns affect the number of workers paying into the system. In the long-term, 65 or more years, the size of past birth cohorts affects the number of old-age beneficiaries. The large increase in fertility rates in the post-war period followed by the sharp reduction and flattening out of fertility rates in subsequent decades to the present explains in large measure the changing fortunes of the OASDI trust funds. As the large birth cohorts born during the baby boom enter retirement, relatively fewer workers will have to support relatively more beneficiaries, raising program costs sharply. Because fertility can have a major impact on financing, it is important that the low-cost and high-cost assumptions fully encompass the full range of plausible outcomes.

**Assumption Recommendation.** The Technical Panel recommends reducing the intermediate total fertility rate (TFR) assumption from 2.00 to 1.90. This Panel agrees with previous Technical Panels that asymmetry in the range between the intermediate and low-fertility and high-fertility values is appropriate. The Technical Panel recommends that, from 2025 on, the low-cost TFR be lowered from 2.2 to 2.1, and the high-cost TFR be lowered from 1.8 to 1.6.

#### Definition of Total Fertility Rate

The primary fertility assumption is summarized in terms of the total fertility rate, which is the average number of births per woman over her lifetime if she experienced the age-specific fertility rates of a given year and survived until the end of her childbearing years. This measure is period-based; it reflects both the ages at which women have children (tempo component) and the number of births women have (quantum component). If women delay having children to later ages, but still have the same number of total children, the period TFR will fall for a period of time (as younger women reduce their birth rates), then rise later (as older women increase their birth rates).

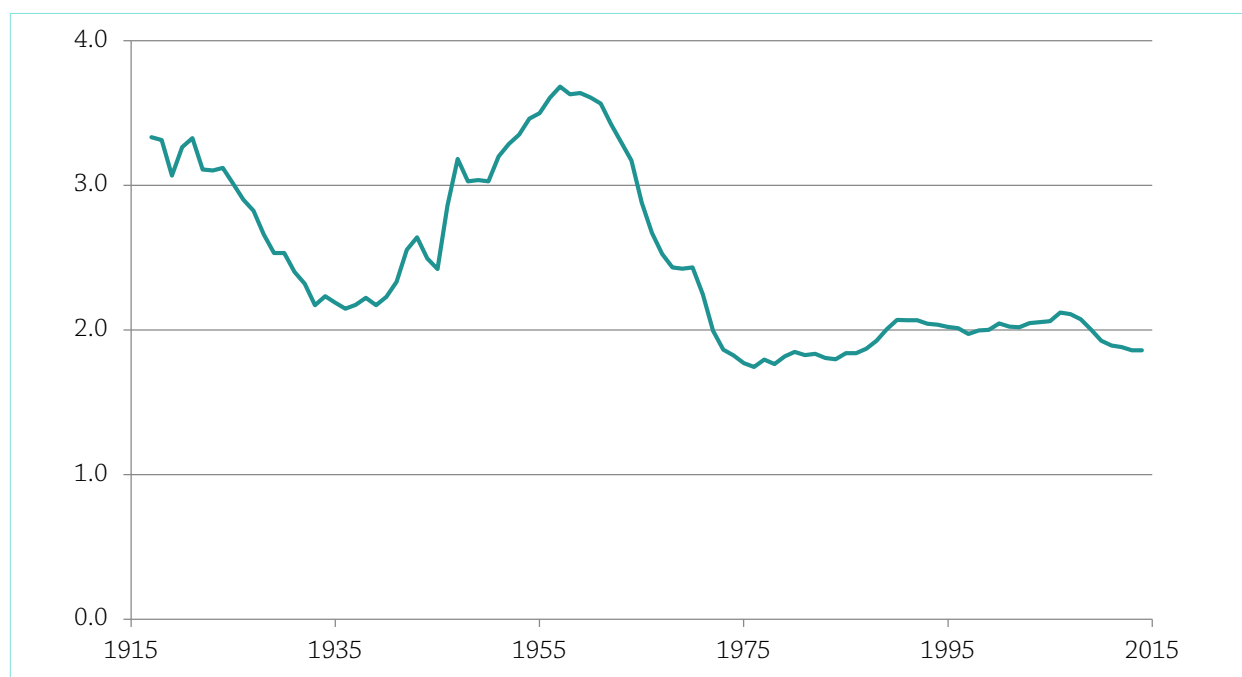
#### Historical Patterns

The TFR has remained within a narrow band of 1.74–2.12 over the past 40 years, with a low of 1.74 in 1976 and a high of 2.12 in 2007. Before this period, when major changes in the TFR have occurred (e.g., the baby boom) the changes have tended to be fairly rapid (a decade or so).

Figure 1 shows the period TFR for the United States since 1917. The broad contours of the trend are well-known: a decline from 1917 until a low point was reached during the Great Depression, an increase towards the end of World War II followed by the post-war Baby Boom, a decline from 1957 until 1972, and relative stability during the past 40 years.



Figure 1. U.S. Total Fertility Rate, 1917–2014



Sources: Max Planck Institute for Demographic Research and Vienna Institute of Demography, *Human Fertility Database*; and U.S. National Vital Statistics Reports.

The period TFR is affected by both the ages when women have children and by how many they have.<sup>6</sup> Changes in the timing of childbearing were the largest component of the Baby Boom and the subsequent decline. One study estimates that 58 percent of the 1936–1957 increase in fertility was due to women having their children at younger ages and that 55 percent of the 1957–1972 decrease was due to women having their children at older ages.<sup>7</sup> It has been tempting for demographers to dismiss timing effects on the TFR and to focus on the underlying change in the number of children that birth cohorts are having. Yet, from the perspective of the Social Security Program and its mandated payments, the tempo effects during the Baby Boom and subsequent decline have had a major impact.

Fertility declines in the late 1960s and early 1970s coincided with a number of fundamental shifts that led to both later childbearing and fewer women having more than two children. These shifts included a sustained increase in educational attainment for both men and women, with the increase being greater for women. Motivated by the desire to take advantage of their higher educational attainment, financial considerations, and the sense of satisfaction that work provides, women increased their labor force

participation. Over the same period, Americans became more open to using child care centers, as more women with preschool children entered the labor force. Many of these trends have continued past the early 1970s and, importantly for consideration of fertility assumptions, it is highly unlikely that they will be reversed. That is, the broad social forces leading to lower and later fertility are likely to continue operating for some time. The availability of effective contraception and legal abortion facilitated the trend to later and lower fertility, with recent abortion restrictions perhaps producing a slight upward pressure on fertility.<sup>8</sup>

Figure 2 illustrates the shift to later childbearing. Plotted are the age-specific fertility rates for 1973 and 2014. The area under the curve, which is the TFR, is virtually identical for these two years, 1.88 and 1.86 respectively. But the 2014 curve has shifted substantially to the right. This trend shows no sign of reversing.

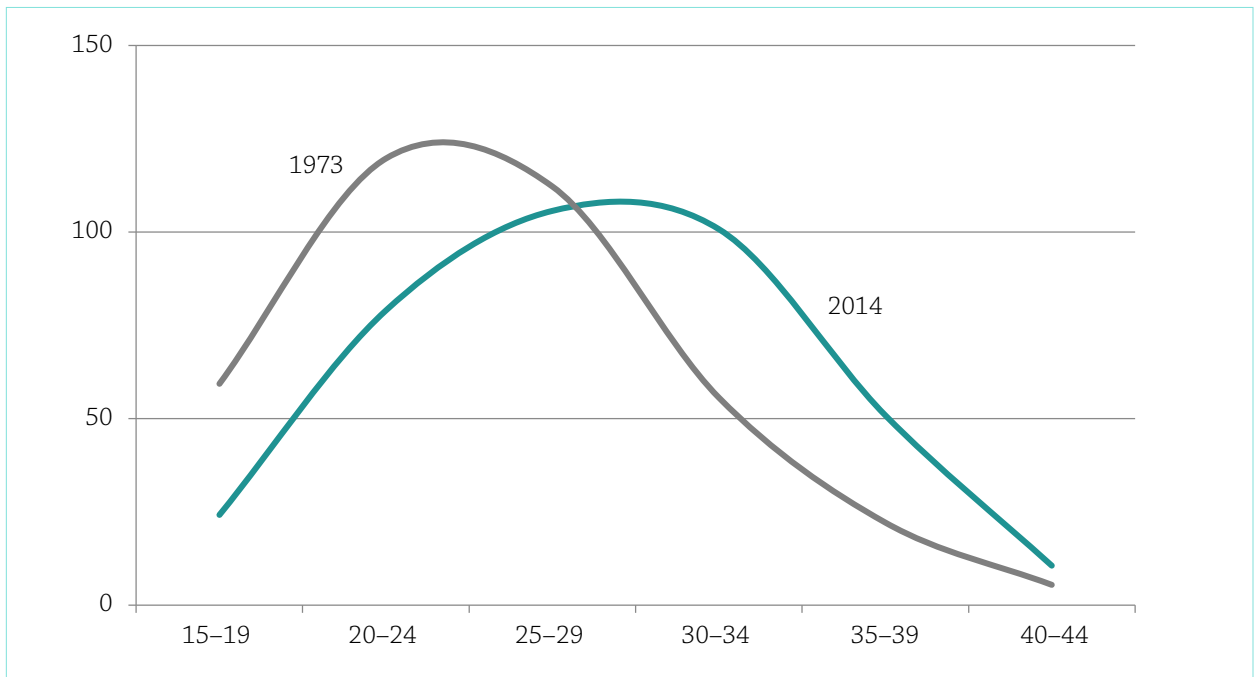
The decline in the number of births per woman over the past 70 years is shown in Figure 3. Women having more than three children dropped sharply over this period. First and second births now make up 71 percent of all births. Again, these trends show no signs of reversing.

<sup>6</sup> Bongaarts and Feeney (1998).

<sup>7</sup> Ryder (1980).

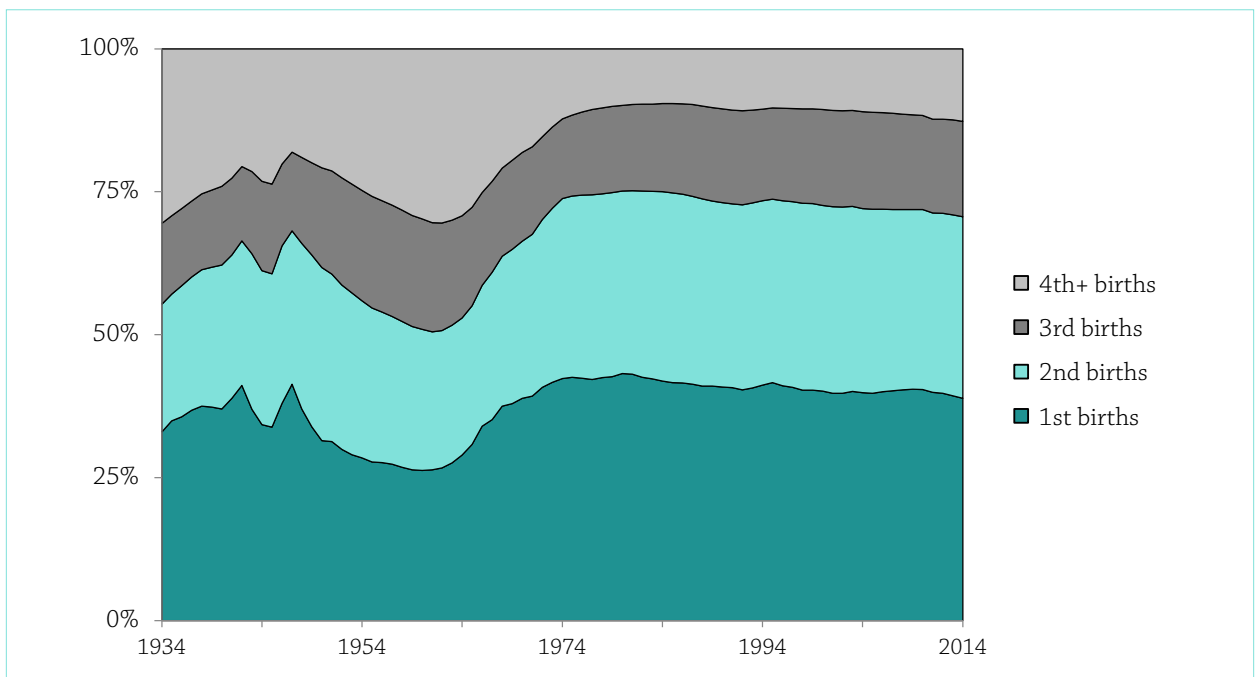
<sup>8</sup> Goldin and Katz (2002).

Figure 2. Age-specific Fertility Rates, 1973 and 2014



Source: National Center for Health Statistics, "Births: Preliminary Data for 2014."

Figure 3. Cumulative Percentage of Annual Births by Parity: United States 1934–2014



Sources: Max Planck Institute for Demographic Research and Vienna Institute of Demography, *Human Fertility Database*; and U.S. National Vital Statistics Reports.

In terms of recent developments, evidence for the United States<sup>9</sup> and other countries<sup>10</sup> suggests that fertility declines during a recession, and recovers thereafter. So far, however, fertility in the United States has shown little sign of recovering. The TFR declined every year from 2007, when it was 2.12, to 1.86 in 2013. Preliminary estimates from CDC for 2014 show a very modest increase of 0.2 percent.<sup>11</sup> The anticipated rebound could be delayed because of the severity of the Great Recession or could signal movement towards a period of lower fertility.

## International Patterns

The United States is not the only country to have fertility rates below 2.1, a level widely considered to be replacement-level fertility. Indeed, all economically developed countries are currently below replacement level. Among countries<sup>12</sup> that have a population over two million, a TFR below 2.1 in 1995 and a per capita GDP greater than \$7,000 in 2002, all but one currently have a TFR either above 1.75 or below 1.50. Taiwan is the lowest with a TFR just above 1.0, and New Zealand is the highest at approximately 2.1. The only country with a TFR near 1.7 is Canada. A closer look at Canada reveals the policies enacted in Quebec to ease the incompatibility of the mother and worker roles, combined with policies that reduce the cost of childrearing, have increased fertility in Quebec. For example, Quebec has made publicly supported child care centers widely available at an affordable price. Such policies are not in effect in the rest of Canada and, therefore, the policies in place in Canada represent a blend of two different regimes.

## Implications of Historical U.S. and International Patterns for Trustees Projections

The 2015 *Trustees Report* assumes an intermediate ultimate TFR of 2.0, a low-cost TFR of 2.2, and a high-cost TFR of 1.8.

### Intermediate Assumption

In terms of the intermediate projection, the 2015 *Trustees Report* assumed that the TFR will rebound from artificially low levels in the wake of the Great Recession to reach 2.07

in 2022. So far, the TFR has shown no signs of a rebound, and the Technical Panel recommends deleting this specific assumption. The Panel thinks that a TFR of 1.9 should be adopted starting in 10 years, rather than the 12 years assumed by the Trustees, as the ultimate intermediate assumption. It is likely that short-term peaks and valleys in the U.S. TFR series will continue, but these fluctuations will have little impact on the Social Security system.<sup>13</sup>

### Low- and High-Cost Assumptions

The 2015 *Trustees Report* assumed a low-cost TFR assumption of 2.2 beginning in 2023. Not one of the 28 economically developed countries discussed above has a TFR higher than 2.1. The last time the United States had a TFR of 2.2 was 1972, and it is highly unlikely that the United States will return to the social conditions facing American women in 1972. Hence, the Technical Panel recommends using 2.1 as the upper bound.

The Technical Panel also thinks that the lower bound of 1.8 in the 2015 *Trustees Report* (reached in 2032) is too high. The only country with a TFR between 1.5 and 1.75 is Canada, which reflects the effects of two different policy regimes—Quebec and the rest of Canada. Such a blend is unlikely to occur in the United States. Rather, if the United States has a fertility decline, it is likely to reach levels found in the lowest fertility countries. Given that low fertility can have a substantial impact on the Social Security system about 20 years after the decline, the Panel believes that it is important to assess the implications of a low-fertility scenario that is rooted in the empirical experience of other countries. Hence, the Technical Panel recommends a lower bound below 1.8. The experience of other economically developed countries mentioned above would suggest a lower bound TFR of 1.5 or lower. Such a lower bound is not unprecedented. The Trustees used a lower bound of 1.5 in 1980. Further, the 1991 Technical Panel recommended a lower bound of 1.4, and the 2007 Technical Panel recommended a lower bound of 1.5. Some members of the Technical Panel, however, felt that a lower bound of 1.5 was too far outside the U.S. historical experience, and so the Technical Panel recommends a lower TFR bound of 1.6, which was the recommendation of the 1995, 1999, and 2011 Technical Panels.

The reason for the asymmetry in the low- and high-cost assumptions is simply that the Panel believes anti-natalist social forces (including the education and labor force reasons mentioned above) are stronger than the pro-natalist forces. Indeed, the demographic literature on fertility does not have arguments about increases in

9 Schneider (forthcoming); Morgan et al. (2011); Chelin et al. (2013).

10 Sobotka, Skirbekk and Philipov (2011).

11 The preliminary estimate for 2014 is 1.862 and the final estimate for 2013 is 1.858 Table 1.1 of the Long Range Demographic Assumptions for 2015 Trustees Report shows the 2013 TFR as 1.870 and 2014 as 1.884 We are unsure of the source of the Trustees numbers. See [http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64\\_06.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_06.pdf) and [http://www.socialsecurity.gov/OACT/TR/2015/2015\\_Long-Range\\_Demographic\\_Assumptions.pdf](http://www.socialsecurity.gov/OACT/TR/2015/2015_Long-Range_Demographic_Assumptions.pdf).

12 The countries are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Singapore, Spain, South Korea, Sweden, Switzerland, Taiwan, the United Kingdom, and the United States. Since it takes about a generation for behavior and institutions to settle into a stable pattern, countries created from the breakup of the former Soviet Union and Yugoslavia are excluded. Data from World Bank.

13 The period conditions that can affect fertility, especially the timing of fertility, can be quite varied. To take a seemingly unlikely example, Rindfuss and colleagues (1978 *Science*) show that the 1954 Supreme Court decision, *Brown versus Board of Education*, depressed fertility among whites in the American South, but not in the rest of the country nor among African Americans in the South.

period fertility levels beyond a slowing or cessation in the postponement of childbearing and improvements in assisted reproductive technologies. No one is predicting that either (or both) will push fertility into the 2.2 range. And the Panel notes that the last two Technical Panels have recommended asymmetrical bounds around the intermediate fertility assumption.

Some suggest that the growing Hispanic population—which historically has had higher fertility rates—is a reason for projecting a higher TFR in the future. However, this argument is not compelling for three reasons: 1) the native countries of many Hispanic immigrants are experiencing declining fertility rates (for example the current TFR in Mexico is 2.2, down from 6.7 in 1970); 2) recent research shows a considerable decline in Hispanic fertility, especially for second and higher generations; and 3) immigrants to the United States tend to postpone childbearing until they arrive and while such postponement makes their period TFR look relatively high, the actual number of children they have is not extremely high.

Finally, it is worth noting that the Trustees assumed as late as their 2014 report that it takes 25 years for the fertility rate to reach the ultimate level, but this period is longer than was required for the major changes that have occurred since World War II. In 1945, the U.S. TFR was 2.5. It peaked in 1957 at 3.8—an increase of 1.3 in 12 years. In 1960, the U.S. TFR was 3.7 and by 1970 it was 2.5—a decline of 1.2 in 10 years. Clearly, when major movements occur in the U.S. TFR, they occur more rapidly than 25 years. The Technical Panel recommends using a 10-year time frame. The 2015 *Trustees Report* moves in the right direction for their intermediate- and low-cost assumptions. Their intermediate assumption reaches its ultimate level in 2027, or only 12 years from now and their low-cost assumption by 2023, only 8 years from now. But the high-cost scenario is projected to reach its ultimate level in 2032, or 17 years from now. The logic for taking longer to reach the high-cost fertility level is neither obvious nor spelled out in the 2015 *Trustees Report*. We note that the TFR dropped from 2.120 in 2007 to 1.858 in 2013<sup>14</sup>—a decline of 0.262 in only 6 years. We recommend that the Trustees reconsider the time assumed to reach the high-cost level.

## ■ 1.2 Mortality

No other assumption has been the subject of a more persistent and unresolved disagreement between the Trustees and successive Technical Panels than that of the assumed ultimate rate of improvement in mortality rates. Five successive Panels in 1995, 1999, 2003, 2007, and 2011 argued that the Trustees were assuming ultimate rates of

mortality improvement below historical averages and that the Trustees' rationale for those lower rates was unconvincing. Each successive Panel expressed its recommendations in a slightly different way—for example, with and without an age gradient or with slower or faster convergence from initial to ultimate rates. Each used a slightly different method to reach its conclusion, although all employed some manner of extrapolation from past trends. Yet, all recommended the ultimate rate of mortality improvement be raised. The last three recommended that the use of a by-cause method of projection be discontinued.

In the published explanation of the Trustees' demographic projections, OCACT does not comment on the level of improvement recommended by each Panel except to note that they assume larger rates of decline than do the Trustees.<sup>15</sup> They do comment on the manner in which the respective Panels made their recommendations. In the case of the 2007 and 2011 Panels, for example, OCACT is critical of the lack of an age gradient in the recommended improvement rate.<sup>16</sup>

This Panel believes it is a mistake to focus on the presentational differences in the various recommendations and urges the Trustees to take note of the clear and remarkably consistent message across the years concerning the overall rate of improvement that should be the basis for the Trustees' projections. Successive Panels recommended an age-sex-adjusted average annual reduction in central death rates of about 1.0 percent per year (see Figure 4).<sup>17</sup> (The 2011 Panel recommended an even faster rate of improvement, equivalent to 1.26 percent per year, and was the only Panel to extrapolate historical age-specific death rates while explicitly accounting for the effects of smoking and to make an empirically grounded adjustment for obesity.)

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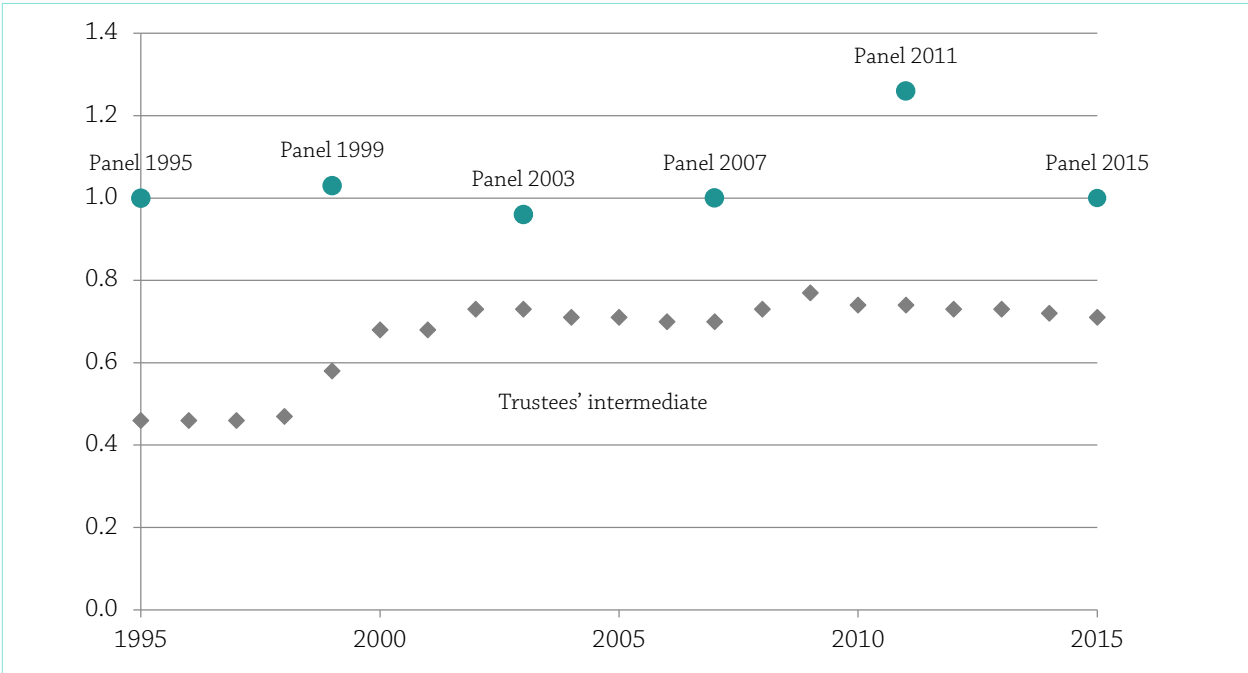
15 "The Long-Range Demographic Assumptions for The 2014 Trustees Report," Office of The Chief Actuary, Social Security Administration, July 28, 2014.

16 OCACT's documentation on the long-range demographic assumptions states: "We feel that the approach of the 2007 and 2011 Technical Panels fails to take into account significant deviations in the rates of reduction by age groups as evidenced by the data.... The rates of reduction at younger ages have been much larger than the rates experienced at older ages. While we agree that differences by age will diminish in the future, we do not believe they will vanish.... The 2007 and 2011 Technical Panels' recommendations stand in stark contrast to that of the 2003 Technical Panel, which recommended using the rates of reduction by age and year. (p7)." The document adds: "A key finding of the 2003 Technical Panel was their recognition of the likelihood that mortality improvement will decelerate in the future. This general concept is entirely consistent with the assumptions used in the Trustees Reports for decades. However, the panel's approach was somewhat awkward .... We believe that the Trustees' assumptions present a superior approach compared to the approach recommended by the 2003 Technical Panel." (p8).

17 An age-sex-adjusted rate assumes that the population proportions by age and sex are the same as in the base year.

14 [http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64\\_01.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_01.pdf)

Figure 4. Ultimate Average Annual Rate of Reduction in (Age-Sex-Adjusted) Central Death Rates: Trustees vs. Technical Panel Recommendations



Sources: *Trustees Reports*, various years; *Technical Panel reports* various years; OCACT.

Despite our disagreement with OCACT's specific assumptions, we find that the Trustees and OCACT have come to their conclusions after examination of historical data on mortality rates by age, sex, and cause of death. The Trustees' assumptions are a plausible interpretation of the ways in which the future will be both similar to and different from the past. However, after our own deliberate study of the past trends, a close reading of past Technical Panel arguments, and consultation with OCACT and outside experts, we conclude that the Trustees have been and continue to be too pessimistic about the future rate of mortality improvement. Unlike the most recent Panels, however, we do support the continued use of the by-cause method of projection, but recommend supplementing it with other approaches.

### Assumption Recommendations

The Technical Panel has four assumption recommendations:

**Assumption Recommendation 1.** Increase the rate of mortality improvement such that the ultimate average percentage reduction in age-sex-adjusted central death rates is 1.0 percent during the last 50 years of the projection horizon. This recommended rate is significantly above the Trustees' currently assumed rate of 0.71 percent over the period 2039–2089. The Panel's recommendation would result in a projected unisex life expectancy at birth in 2090 of

88.3 years, and a life expectancy at age 65 in 2090 of 25.3 years, compared to 85.9 and 23.6 respectively assumed in the 2015 *Trustees Report*.

**Assumption Recommendation 2.** Apply the same rate of ultimate mortality improvement for both males and females (as the Trustees currently do).

**Assumption Recommendation 3.** Retain the assumption that the projected mortality improvement rate varies by age and declines at older ages, as observed in historic data.

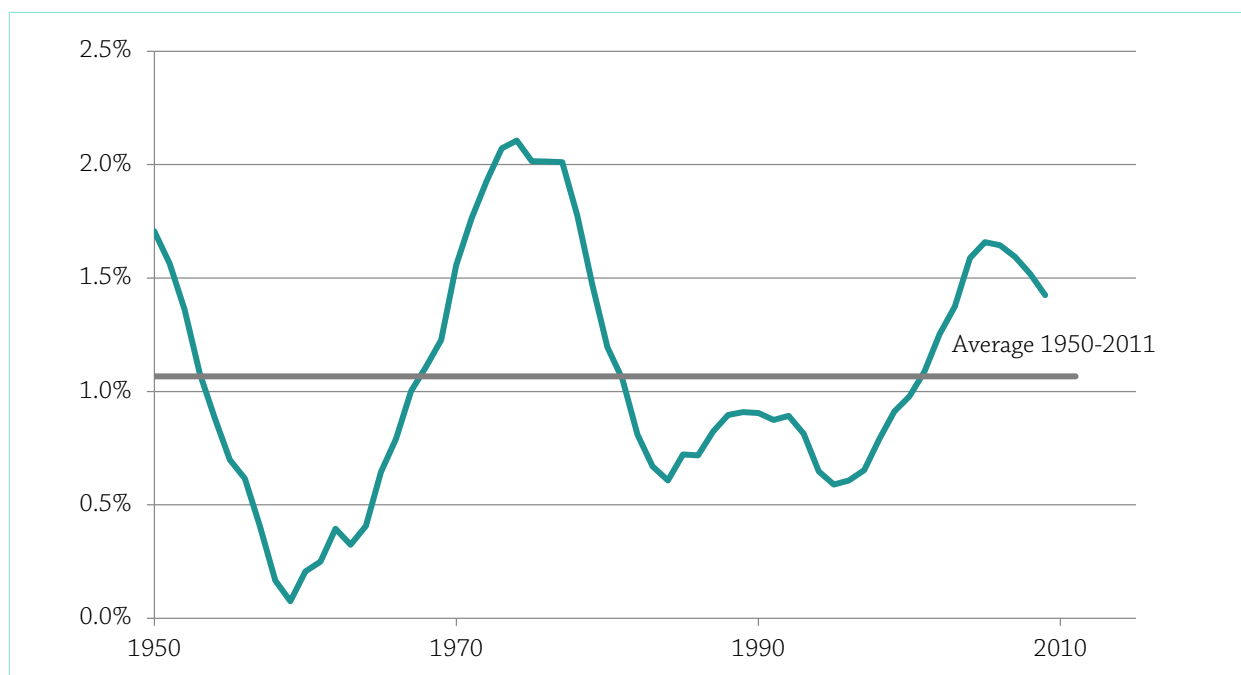
**Assumption Recommendation 4.** Increase the low-cost average mortality improvement rate from 0.4 percent to 0.5 percent and the high-cost rate from 1.0 percent to 1.5 percent.

### Rationale for Assumption Recommendations

#### (1) Ultimate Rate

The Panel recommends that the Trustees increase their ultimate assumed rates of mortality decline to be more consistent with the historical average since 1950, to be more consistent with international experience, and to reflect expert opinion regarding anticipated long-term mortality trends that more fully integrate the impact of smoking and obesity. Our rationale follows along the lines suggested by five successive prior Technical Panels.

Figure 5. Average Annual Reduction in Age-Sex-Adjusted Central Death Rates for Rolling 10-Year Periods (Centered), 1950–2011, All Ages



Source: 2015 Trustees Report, Panel calculations.

We find that the historical period since 1950 is a reasonable period on which to base future projections. It is sufficiently long to avoid giving too much weight to short-term trends, and it represents a time when many of the factors likely to play a role in future mortality improvement, such as breakthroughs in medicine and technology and large-scale behavioral trends, became important. The period also included one large-scale epidemic (HIV/AIDS). Figure 5 illustrates that although the rate of improvement fluctuated significantly over the years since 1950, the Technical Panel’s recommendation of a 1.0 percent improvement in the age-sex-adjusted annual rate of reduction in central death rates is close to the average for the entire period (see black line, Figure 5).

When making long-term projections, it is tempting to speculate about whether specific historical, medical, social, economic, behavioral and technological developments will be replicated in the future. This Panel believes, however, that given our current state of knowledge, the best, albeit imperfect, guides to the future may be past trends and international experience. Trends have been surprisingly regular over the past half century, and international

experience suggests at least a continuation and perhaps acceleration of long-term trends in the United States, at least at older ages.<sup>18</sup>

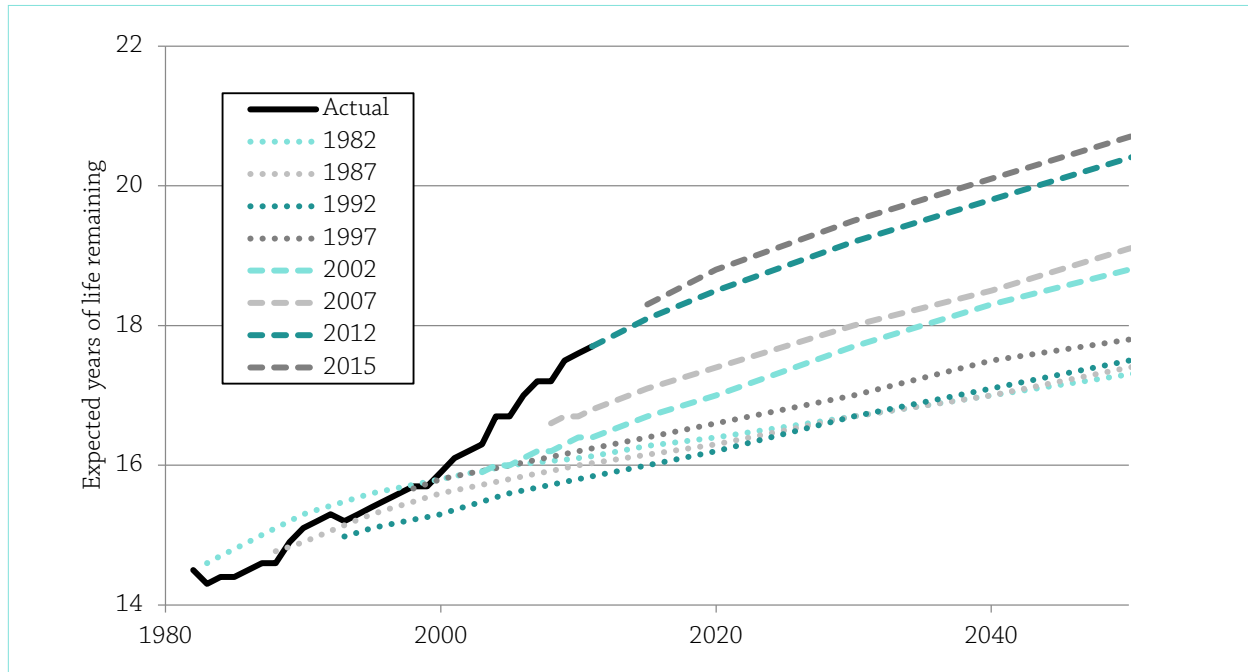
#### *Accounting for drivers of health: smoking and obesity.*

Research suggests that formally taking account of how smoking behavior affects patterns of mortality improvement by successive cohorts can improve projections.<sup>19</sup> For both males and females, smoking affects mortality with an average delay of two to three decades. The prevalence of smoking among men peaked at very high levels in the 1940s-1950s and began to decline steadily in the 1960s. The unfavorable impact on mortality of males grew from 1950 to 1990, after which the decline in smoking began to have a favorable effect on mortality improvement. Female smoking peaked more than a decade later, albeit at a much lower level than for males. The unfavorable impact of smoking on mortality of females increased from 1980 to 2000, and the favorable effect on mortality improvement from decreased smoking is just now beginning to be observed.

18 Some reasons to be cautious about assuming faster rates of improvement include 1) a reduction in improvement in mortality due to cardiovascular diseases may occur; 2) the mortality improvement from smoking cessation might wane after 25 years; 3) obesity is likely to have some adverse effect over the long term; 4) the favorable effects for males due to smaller smoking prevalence may be reduced over time; 5) the gains due to increases in educational achievement may have a smaller effect; 6) U.S. mortality at 90+ already compares favorably with that of other countries, leaving less space for improvement; and 7) future advancements in medical treatment and technology may be offset by adverse events or conditions, such as pandemics, climate change and terrorism..

19 Preston, Gleit and Wilmoth (2010), Bongaarts (2006), TPAM 2011.

Figure 6. Projections of Male Life Expectancy at Age 65 from 1982–2015 Trustees Reports versus Actual Experience



Source: Trustees Report, various years.

In short, smoking explains a large part of the observed slowdown in mortality improvement for males in the 1960s through the 1980s, and the speedup thereafter. Conversely, it has had a negative effect for females since the 1980s until recently. If smoking prevalence continues to wane, mortality is likely to improve well into the future.

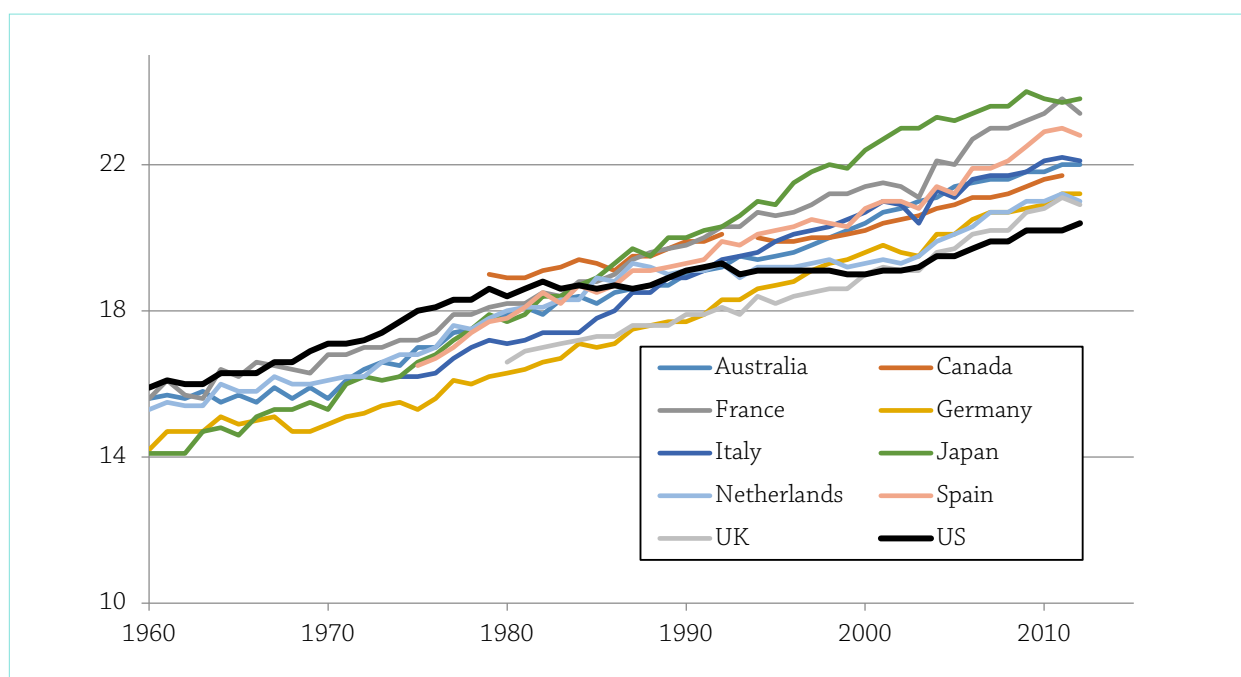
The prevalence of obesity has grown rapidly since 1970, although it appears to have been stabilizing recently. The impact of obesity on mortality is less clear cut than for smoking, but the current longer exposure and prevalence of obesity may result in slower improvements in mortality rates.

**Recent experience.** The Trustees' projections of mortality improvement over the recent past have tended to underestimate the actual rate of improvement in the short to

medium term. While improvement in the short term does not mean sustained improvement over the long term, actual experience is more consistent with the past Technical Panel projections than with the Trustees' expectations. For example, Figure 6 shows the implications of assumptions about improvement in mortality for life expectancy at age 65 for males. Actual experience quickly exceeded the Trustees' projections from 1987–2007. The 1982 projection was higher than actual experience for a few years but was well below life expectancy achieved from 2002 through 2010. On the other hand, mortality improvement between 2009 and 2013 appears to be well below the trend of the prior 10 years, and it will be important to watch whether this pattern continues.



Figure 7A. International Comparison: Female Life Expectancy at Age 65 Trends 1960–2012



Source: OECD, 2015.

Some critics suggest that OCACT's underestimates of mortality improvement since 2000 reflect an intellectual bias in the face of increased political pressure to show a more favorable condition for Social Security finances.<sup>20</sup> The Panel does not find this explanation persuasive or useful. The most likely explanation involves the inability of OCACT's projection methodology to effectively cope with turning points—a common problem in projections of various kinds. OCACT's methodology relies on mortality data that occur with a lag of several years, so the short-term projection requires two steps. First, OCACT estimates the most recent several years of historical data. Then they project rates of improvement (by cause, age and sex) that converge to the “ultimate” rates of mortality improvement in years 25 through 75 of the projection period assumed by the Trustees. The necessity of estimating before projecting makes it impossible to spot turning points. Given

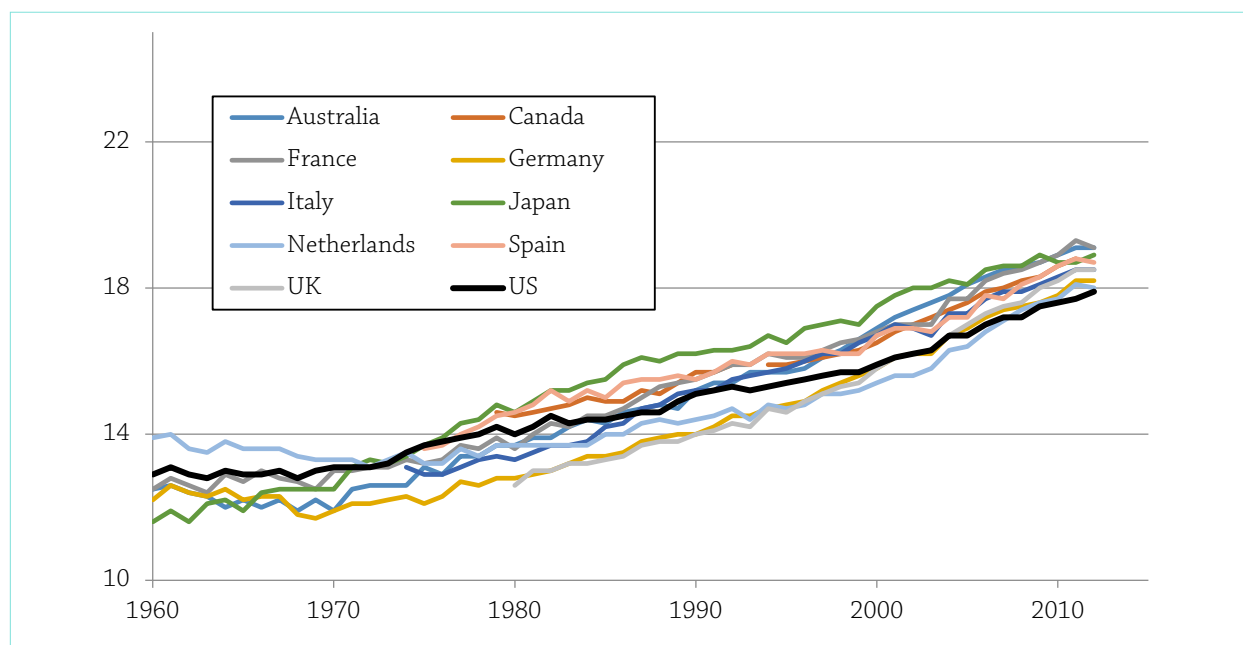
the importance of mortality in OCACT's overall projection of SSA's fiscal solvency, research into improved methods for short-term mortality estimates and projections should be high on OCACT's research agenda.

*International comparisons.* The Panel agrees with several of the past Panels that comparing the U.S. experience to that of other similarly economically developed, low-mortality countries can help inform our projections, as they show that achievement of future mortality improvement is achievable. Figures 7A and 7B illustrate that improvements in life expectancy at age 65 and above for females and males in the United States have been slower than for nine of their peer countries from 1960 to 2010. For males that pattern is most evident during the period 1970–1995, and for females, from 1980 through the present, closely related to adverse periods in American mortality due to relatively high smoking prevalence.

<sup>20</sup> Kashin, King, and Soneji (2015).



Figure 7B. International Comparison: Male Life Expectancy at Age 65 Trends: 1960–2012



Source: OECD, 2015.

To the extent that many other countries have already attained higher levels of life expectancy and have experienced more prolonged rapid improvement in mortality rates, it is hard to argue that the United States faces any technological or biomedical barriers to achieving similar rates of improvement. The current Trustees' projections mean that it will take U.S. men 25 years to reach the level of life expectancy at birth experienced by Australian men today; and for American women it will take 40 years to reach the level attained by French women today.

Moreover, the relative slowdown in mortality improvement for U.S. males and then for U.S. females appears anomalous in the international context. A recent National Research Council study concludes that the differences in life expectancy between the United States and other similar countries can largely be explained by historical patterns of smoking and to a lesser extent the prevalence of obesity.<sup>21</sup> Given the earlier decline in smoking prevalence in the United States, the future rates of U.S. mortality improvement may become more consistent with the experience of many other countries.

One final note, in contrast to mortality at other ages, Americans older than age 85—and particularly those over age 90—are experiencing favorable mortality relative to that of many other countries.

## (2) Convergence of Rates of Improvement for Men and Women

Mortality improvements were faster for American females through about 1980, and faster for males thereafter. As discussed above, the leading explanation for this reversal is smoking behavior. As smoking prevalence has begun to converge at a much lower level, it is reasonable to assume that mortality improvement for females will become similar to that for males after 2040, the ultimate period for mortality improvement assumptions. In recognition of these trends, since 2011 the Trustees' ultimate assumptions are the same for males and females. We find this reasoning sound and support continuing this practice.

## (3) Age Gradient

Historical data show that mortality rates have tended to improve faster at younger ages and slower at older ages. Over time, however, the rate of improvement has slowed at younger ages and accelerated at older ages, resulting in a flatter but still clear age gradient of mortality improvements (See Table 3). Some, including the 2007 and 2011 Panels, believed the uncertainties inherent in mortality projections and the subjective nature of projecting age-varying mortality improvements should favor assuming a constant rate of improvement in mortality for all ages. The Panel, however, believes that if relevant historical experience supports a slower rate of mortality improvement with advancing age and the underlying factors involved can be identified and reasonably estimated, the projections should reflect an age gradient. We recommend that the Trustees continue to assume an age gradient.

21 National Research Council of the National Academies (2011).

Table 3. Average Rates of Mortality Improvement by Sex, Age, and Period, and Trustees Assumptions 2039–2089.

Age Groups	Male			Female			Trustees Assumptions 2039–2089
	1950–2011	1980–2011	2000–2011	1950–2011	1980–2011	2000–2011	
0–14	2.94%	2.46%	1.72%	2.82%	2.26%	1.53%	1.57%
15–49	0.99%	1.12%	1.28%	1.25%	0.53%	0.63%	0.90%
50–64	1.49%	1.71%	1.14%	1.19%	1.19%	1.41%	1.06%
65–84	1.07%	1.59%	2.32%	1.14%	0.74%	1.74%	0.74%
85+	0.42%	0.26%	1.50%	0.77%	0.06%	1.17%	0.48%
<b>All Ages</b>	<b>1.02%</b>	<b>1.23%</b>	<b>1.78%</b>	<b>1.08%</b>	<b>0.61%</b>	<b>1.43%</b>	<b>0.71%</b>

Source: The Long-Range Demographic Assumptions for The 2015 Trustees Report; historical data provided by OCACT.

#### (4) Low-Cost and High-Cost Assumptions

The Technical Panel recommends increasing the low-cost average mortality improvement rate from 0.4 percent to 0.5 percent and the high-cost rate from 1.0 percent to 1.5 percent. Thus, the mortality improvement assumption for periods after 2039 would remain roughly symmetric around the intermediate projection assumption. This pattern reflects the Panel’s belief that potentially favorable developments such as future medical breakthroughs are expected to be as likely as potentially unfavorable developments such as new epidemics or pandemics.

#### Methodology Recommendations

The Technical Panel has four recommendations regarding methodology:

**Method Recommendation 1.** The Technical Panel recommends retaining the current mortality model that involves separate projections by cause of death.

**Method Recommendation 2.** The Technical Panel recommends investigating the utility of alternative approaches to projecting mortality and periodically publishing how their results compare to the current model. In particular, the Panel recommends conducting research into methods that formally incorporate drivers of mortality, such as smoking and obesity, and into methods that take account of cohort effects.

**Method Recommendation 3.** The Technical Panel recommends investigating alternative methods for establishing a starting point for the projections and for the process of transitioning from the current period to the ultimate rates of mortality improvement.

#### Rationale for Methodology Recommendations

##### Projections by Cause of Death

The primary methodology used by OCACT for projecting mortality rate improvements is a “by-cause” model, incorporating five categories of causes of death (cardiovascular disease, malignant neoplasms (cancer), respiratory disease, violence, and all others). The by-cause model is used for projecting the ultimate mortality assumption, which covers years 25–75 of the projection period. For shorter-term projections, OCACT relies on recent historical data, gradually moving from these values to the ultimate assumption in projection year 25.

Past Technical Panels have been critical of the Trustees’ reliance on projections by cause of death and have suggested that the information gained from a formal by-cause model is unlikely to improve the projections. They have said that by-cause models are too complex, with too many parameters to be selected and that future mortality cannot be known in sufficient detail to estimate separate rates of improvement for each cause. In addition, at worst the use of this model may bias improvement rates downward, since cause categories with lower assumed improvement rates will tend to dominate others over time.

The Panel appreciates the varied criticism of the by-cause method, but does not recommend that the Trustees discontinue using it at this time. First, most mortality projections are developed in consultation with medical professionals about causes of death; incorporating mortality improvement by cause of death directly makes these assumptions explicit and transparent. Second, partly reflecting input from prior Panels, OCACT has taken steps to simplify its model by decreasing the number of cause of death categories from eight to five and using a common rate of mortality improvement for males and females, thus reducing the number of explicit parameters needed to derive the

mortality projections. These changes make the model more tractable. Third, methods of extrapolating past trends into the future have their own shortcomings: for example, the selection of the historical period from which to base the extrapolation is by definition arbitrary. The Panel believes that both by-cause methods and extrapolation methods are useful.

While the Panel recommends that OCACT continue to use the by-cause method as its primary projection tool, it recommends that OCACT: 1) investigate the desirability of further simplifying the model by reducing the number of cause categories; 2) provide more detail on the basis from which the ultimate rates of mortality improvement are chosen; and 3) periodically publish projections of alternative all-cause models, and describe the ways in which the by-cause model improves the resulting projections. If OCACT does not have the resources to adequately test alternative methods and benchmark them against each other, they should provide sufficient data to outside researchers to enable replication of OCACT's projections and to develop alternative projections.

Acknowledging the tension between a call for simplification and incorporating new drivers, the Panel nevertheless recommends that OCACT evaluate ways of formally incorporating smoking and obesity into the projection methodology as well as birth-cohort-related mortality patterns as appropriate. Since the effect of improvement in mortality is concentrated at older ages, OCACT and the Trustees should invest more heavily in research on mortality at age 60 and above, for example on the effect of increasing reported mortality due to dementia (including Alzheimer's).

### Methods of Transitioning from Year of the Trustees Report to Ultimate Assumptions

The Panel recognizes the difficulty in estimating the slope and turning points in projecting rates of mortality improvement, which in part has resulted in the underestimation of mortality rates referred to above. Nevertheless, the Panel believes that the use of alternative approaches to transitioning from the most recently available rates of mortality improvement to the ultimate rates should also be considered to attempt to better capture trends and turning points in mortality improvement rates.

### Socio-economic Factors

Differences in mortality due to socio-economic factors are reflected by the Trustees in the projections of future trends in the average size of benefits. Currently, average benefits after the date of entitlement are assumed to grow by about 0.45 percent annually due to the fact that those with the highest benefits (based on higher lifetime

earnings) are also expected to have longer life spans. The Panel believes that reflecting these trends through a series of "post-entitlement factors" is reasonable. The Panel encourages the Trustees/OCACT to continue to monitor future trends in differential mortality by income and education to determine whether the estimated effect on benefit growth should be adjusted in the future.

## ■ 1.3 Immigration

The Technical Panel acknowledges that immigration is a volatile, unpredictable, poorly-understood, and increasingly politically-driven process, and that the long-range projections required of the Trustees therefore are exceptionally challenging. At the same time, the Panel recognizes that methods and assumptions about future U.S. immigration are becoming increasingly important for the overall usefulness of the Trustees' long-range projections. With these realities in mind, the Technical Panel respectfully offers three recommendations.

### Assumption Recommendation 1: Net Total Immigration.

The Trustees intermediate projections assume declining net total immigration over the projection period. However, the Technical Panel concludes that net total immigration is more likely to increase for the reasons discussed below. Therefore, the Panel recommends that the Trustees raise their intermediate assumption for net total immigration from an average of 1,155,000 in the 2015 *Trustees Report* to 1,298,000. And the Panel recommends that the low-cost and high-cost projections be increased from an average of 1,465,000 to 1,655,000 and from 850,000 to 960,000, respectively.

These recommendations are intended to serve only as interim adjustments; they were derived by averaging together two different sets of projections—one from the Trustees and one from the Census Bureau—that move in divergent directions. The Panel acknowledges that this procedure is not an acceptable way to create credible long-range projections. Therefore, our primary recommendation is that OCACT and the Census Bureau work together to develop a set of improved projections that we expect will reflect the Panel's judgment that the level of net total immigration is more likely to rise than decline.

The Panel is not suggesting a mechanistic approach, such as an assumption that net total immigration will be at a constant rate applied to a growing U.S. population base, but instead wishes to draw the attention of the Trustees to the following components:

- a. “Legal immigration.” The Panel recommends that revised assumptions of increasing “legal immigration” be adopted for the Trustees’ intermediate scenario. The key reason is the absence under current law of any numerical limits on legal permanent residence (LPR) visas available for immediate relatives (spouse, widow(er), unmarried minor children, and parents) of U.S. citizens. This lack of constraint means that those who naturalize from among the large numbers of earlier legal immigrants will be able to obtain LPR visas for their immediate relatives, without numerical limits. In addition, anyone from among the expanding numbers of temporary visa holders who marries a U.S. citizen and naturalizes also is entitled to obtain LPR visas for their immediate relatives. As a result, the future volume of legal immigration under “current law” is more likely to rise than to decline or remain constant.
- b. “Legal emigration.” The Panel recommends that OCACT, in collaboration with the Census Bureau, develop more current estimates of legal emigration (i.e. departure of U.S. citizens and legal permanent residents from the Social Security Area population). We are concerned that past Trustees’ projections have been unduly influenced by out-of-date estimates of such emigration derived from Census data that are now 25–35 years old, when circumstances were very different.
- c. “Net other immigration.” The Panel recommends that the Trustees long-range projections assume increases rather than declines in the volume of “net other immigration.” This recommendation reflects our reservations about the Trustees’ assumption to hold essentially constant the annual *rate* of “other emigration” over the long term, which—when applied to the projected growing pool of “other immigrants”—leads to an improbably large decline in projected “net other immigration.”

**Assumption Recommendation 2: Executive Actions.** The Technical Panel recognizes the inherent difficulties associated with any treatment of “executive actions” in long-range projections. The Trustees decided in their 2015 report to treat both the 2012 and 2014 executive actions as “current law” in their projections. The Technical Panel would have included the 2012 action but would have deferred inclusion of the more recent and more significant executive actions announced in late 2014. The Panel’s understanding is that the 2012 executive actions have already been implemented, but that the 2014 executive actions are being actively challenged in both the courts and in Congress, and that their

implementation currently is suspended under a preliminary injunction issued by a Federal District Court.<sup>22</sup> These are hard calls, however, and the Technical Panel accepts the Trustees’ decision. In the treatment of any executive action, the Technical Panel urges the Trustees to modify their overall projections to reflect the positive feedbacks on “legal immigration.”

**Presentation Recommendation.** The Panel recommends that the Trustees present graphical representations of all of the assumed trajectories included in its immigration projections, in addition to the data tables included in past reports. Such graphical presentations would provide readers with a clearer understanding of the Trustees’ assumptions and their effects upon the immigration projection outcomes. Specifically, such graphs would clearly show that the downward trajectory of net total immigration that appears in the Trustees’ 2015 intermediate projection is being driven primarily by assumptions of future declines in “net other immigration.”

These recommendations reflect the Technical Panel’s recognition that methods and assumptions about future U.S. immigration are very important to the overall usefulness of the Trustees’ long-range projections. Since the 1970s, immigration to the United States has been increasing substantially, while fertility rates over the same period have trended lower (though they remain much higher than those of most OECD countries). The combination of these two trends has greatly increased the demographic significance of international migration.

Estimates of current U.S. net immigration (about 1.3 million per year) are roughly comparable to those of “natural increase,” i.e. births minus deaths of about 1.3 million, meaning that net immigration now accounts for about half of U.S. population growth. If, in addition, U.S. births to immigrants are counted as a demographic effect of immigration, net immigration is accounting for over one-half of U.S. population growth.

Oddly enough, while immigration is a more important contributor to demographic increase than often appreciated, its effects upon the age distribution of the population are frequently overstated. It is often argued that increasing immigration would compensate for declining percentages in the “working ages” (e.g. 18–64) in the projected U.S. population, because a higher proportion of immigrants are in these age groups. Most quantitative analyses of such effects, however, show that increasing immigration from current levels would produce quite small impacts on the overall percentage of the “working age” population.

<sup>22</sup> As of August 5, 2015.

## Methodology

While immigration has become a very important component of U.S. demographic change, developing credible long-range immigration projections involves daunting challenges:

1. U.S. immigration data have serious and longstanding weaknesses, meaning that official data for both base-lines and trends that are essential for projections are unusually problematic. Such data weaknesses required the Census Bureau in 2009 to extensively revise projections of the 2050 U.S. population that it had published only a year earlier.<sup>23</sup> In comparison, recent Government data on births and deaths are far better.
2. Trends in both immigration and emigration have proved to be volatile, making assumptions over the long-term more problematic than those for the less-volatile trends in fertility and mortality.
3. The research literature on immigration has produced no credible theory that might assist the Trustees in developing their projection assumptions for U.S. immigration. In contrast, theoretical understanding of fertility and mortality is far more robust.

In addition, immigration patterns are more affected by legislation, judicial rulings, and executive actions and administrative practices than are fertility and mortality. Global demand for access to U.S. immigration visas far exceeds supply, and hence actual net immigration numbers depend substantially upon legislative, judicial, and executive/administrative decisions.

Moreover, the U.S. immigration system is highly complex: the law includes a surprisingly large number of visa categories, many of which interact with other categories in ways that often have not been considered or well understood by policymakers. One result is that many effects of past policy changes have been very different from those intended or promised, often surprising both proponents and opponents of such measures.<sup>24</sup> Moreover sponsors of recent immigration legislation have explicitly declined to offer any estimates of the numerical effects of their proposals, leading to wildly different numbers emerging from different government agencies, think-tanks, and interest groups.<sup>25</sup>

In summary, immigration is a volatile, unpredictable, poorly-understood, and increasingly politically-driven process. Yet the Trustees are obliged to produce 75-year projections for the U.S. population, and net total immigration has become a major driver of U.S. population change.

The shaded text box (opposite page) defines the migration categories used by the Trustees. A variety of misunderstandings can arise from these categories and other aspects of the Trustees' assumptions.

Limiting "legal immigration" solely to those granted legal permanent residence is consistent with usage by other U.S. government agencies, but very different from everyday parlance and journalistic usage, in which persons residing lawfully within the United States on long-term but not permanent visas generally are considered "legal immigrants."

The Trustees' assumptions for "legal immigration" include little or no increase in volume over the 75-year projection period, on grounds that current law includes numerical caps on most sub-categories of legal permanent residence visas. However, the largest single sub-category of such visas—that for immediate family of U.S. citizens—actually is not subject to any numerical limits. Moreover, large numbers initially admitted under temporary visas "adjust status" to that of legal permanent resident (mostly by obtaining permanent employment-based visas or through marriage to a U.S. citizen), and then are eligible to become U.S. citizens after relatively short waiting periods,<sup>26</sup> thereby creating feedbacks between the temporary and permanent visa sub-systems. This relationship suggests that an upward rather than static trajectory would be more likely in the numerically-unlimited immediate family sub-category of "legal immigration" over the longer term.

As noted above, the "other immigrant" category used by the Trustees consists primarily of unauthorized/undocumented/illegal immigrants. However it also includes those admitted quite lawfully on "temporary" or time-limited visas, thereby diverging from usage in U.S. immigration law and by other government agencies, which classify such visas as "non-immigrant." Many of those now classified as "other immigrants" are legally-resident, Social Security-eligible, and on visas that allow for very lengthy (though not permanent) residence in the United States, in many cases for more than the 40 quarters of employment required to qualify for Social Security benefits. This group has become quite large and continues to increase.

<sup>23</sup> <http://www.census.gov/population/projections/data/national/2009/2009comparisonfiles.htm>.

<sup>24</sup> Many of the effects of immigration legislation enacted in 1965, 1986, and 1990 were not anticipated even by sponsors of these Acts. For example, the reforms in 1986 and 2000 were both described as enhancing enforcement, yet the size of the unauthorized/undocumented/illegal pool increased substantially after their implementation.

<sup>25</sup> See report on an expert meeting to discuss the underlying differences between these projections in Lowell and Bump (2006). See also Lowell (2014).

<sup>26</sup> Typically 5 years, sometimes shorter.



## Migration Categories Used by Trustees

In describing the assumptions about immigration used in the Trustees' long-term projections, it is important to note that the migration categories they address differ from those used by other government agencies. Moreover, in many respects, governmental terminology differs considerably from everyday usage of the same English words. Both kinds of differences contribute to misunderstanding and confusion. The categories and definitions used by the Trustees are as follows (emphasis added for clarity):

**“Legal immigration”**: defined as the annual number of persons granted legal permanent residence (LPR) status.

**“Legal emigration”**: the annual number of U.S. citizens & LPRs who leave the “Social Security area population.”

**“Net legal immigration”**: the difference between these two

**“Other immigration”**: persons who enter the Social Security area population in a given year and stay through the end of that year but do not acquire legal permanent residence status. This category includes disparate sub-categories, including:

- Unauthorized/undocumented/illegal migrants: This is the largest sub-category, itself divided between those who enter U.S. territory without permission or inspection, and those who enter on lawful visas (e.g. as tourists) but then violate the terms of those visas.
- Foreign workers who enter lawfully on “temporary” or time-limited visas and do not violate their terms. Hence they are legally present, but have not been granted the legal permanent residence visas required by the “legal immigration” definition; and
- International students, also admitted lawfully for educational purposes but not for permanent residence.

**“Other emigration”**: those in the “other imigrant” category who leave the Social Security area population, or who adjust their immigration status to become legal permanent residents.

**“Net other immigrants”**: the difference between “other immigration” minus “other emigration.”

**“Net total immigration”** then is simply the sum of “net legal immigration” and “net other immigration.”

The Trustees' understandable use of “Social Security area population” as part of their definitions adds further complexity, since it includes both non-citizens and citizens alike who are living outside U.S. territory but are entitled to payment of Social Security benefits due to past employment-based contributions or other types of eligibility. It injects a further definitional difference between the populations being projected when compared with those projected by other Federal agencies such as the Census Bureau.

Finally, the Trustees' projections include alternate assumptions about net immigration that are termed low-cost, intermediate, and high-cost—though such usage may lead to misunderstandings for those unaware that these “cost” estimates relate solely to net payouts from the Social

Security system itself, rather than to overall governmental costs (and of course benefits) of net immigration for Federal, State, and local governments, and to U.S. society and the economy more generally.<sup>27</sup>

## Assumptions

**“Legal immigration”**: With respect to legal immigration (also sometimes termed “gross legal”), the Trustees' assume essentially constant annual inflows over the projection period 2020–2080 (see Table 4). For the intermediate projection, this number is set at 1,060,000 per year. The low-cost and high-cost variants are also assumed to be essentially constant over the projection period, differing above and below the intermediate assumption by a constant 200,000 per year.

<sup>27</sup> See also Panel recommendation #2 in the Presentation of Uncertainty section about “low-cost” and “high-cost” terminology.

Table 4. Immigration Values Used for 2015 Trustees Report

Alternative	Year	Gross legal	Net legal	Gross other	Net other
Intermediate	2015	1,060,000	795,000	1,400,000	670,000
	2030	1,060,000	795,000	1,350,000	395,000
	2040	1,060,000	795,000	1,350,000	340,000
	2050	1,060,000	795,000	1,350,000	315,000
	2060	1,060,000	795,000	1,350,000	300,000
	2070	1,060,000	795,000	1,350,000	290,000
	2080	1,060,000	795,000	1,350,000	290,000
	2090	1,060,000	795,000	1,350,000	285,000
Low cost	2015	1,185,000	950,000	1,500,000	695,000
	2030	1,260,000	1,010,000	1,650,000	530,000
	2040	1,260,000	1,010,000	1,650,000	440,000
	2050	1,260,000	1,010,000	1,650,000	400,000
	2060	1,260,000	1,010,000	1,650,000	375,000
	2070	1,260,000	1,010,000	1,650,000	365,000
	2080	1,260,000	1,010,000	1,650,000	360,000
	2090	1,260,000	1,010,000	1,650,000	355,000
High cost	2015	910,000	635,000	1,100,000	445,000
	2030	860,000	600,000	1,050,000	310,000
	2040	860,000	600,000	1,050,000	265,000
	2050	860,000	600,000	1,050,000	245,000
	2060	860,000	600,000	1,050,000	235,000
	2070	860,000	600,000	1,050,000	225,000
	2080	860,000	600,000	1,050,000	220,000
	2090	860,000	600,000	1,050,000	220,000

Source: The Long-Range Demographic Assumptions for the 2015 Trustees Report, Table 3.1, 2015.

**“Legal emigration”:** The Chief Actuary notes that “statistics on emigration are sparse and most analysis is based on estimates.”<sup>28</sup> Our understanding is that the estimates currently being used are actually 25–35 years old, based upon data from the 1980 and 1990 Censuses. On the basis of such data, the Trustees assume that the number of legal emigrants per year is a constant 25 percent of legal immigration per year from 2020–2080. For the low-cost and high-cost variants, the percentages are set at 20 percent and 30 percent respectively.

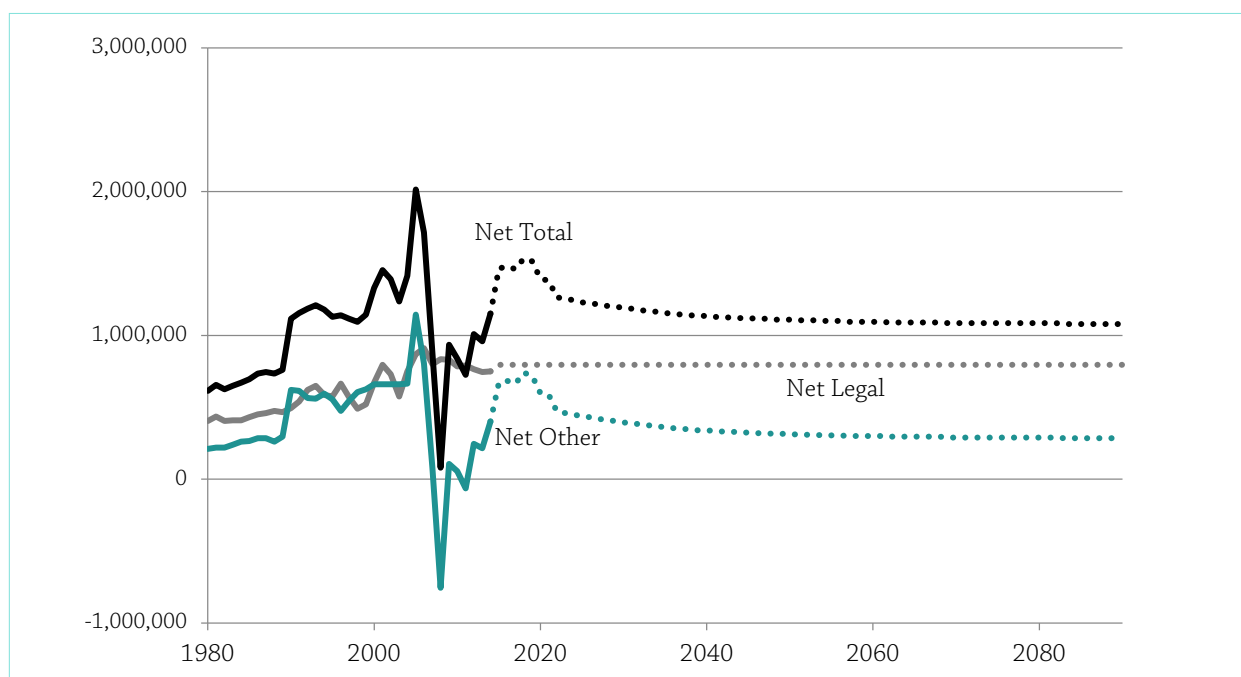
**“Net legal immigration”:** Based on the assumptions above, “net legal immigration” under the intermediate variant is set at a constant 795,000 per year. The low-cost and high-cost variants are also based on assumed constant numbers per year from 2020–2080, at 1,010,000 and 600,000 respectively.

**“Other immigration”:** The Trustees’ projections assume that “other immigration” will increase over the very short term, from around 1,400,000 in 2015 to 1,550,000 in 2018/19 (intermediate projection), “reflecting a recovery from recession-depleted levels of the other-immigrant population.”<sup>29</sup> “Other immigration” is then assumed to decline back to 1,350,000 by 2022, due to assumptions of more effective enforcement and a waning of the projected “recovery” increase, and from then on to remain constant at that level through 2080. Alternative low-cost and high-cost projections also assume constant annual flows of “other immigrants” over most of the projection period, but at annual levels 300,000 higher and 300,000 lower than the intermediate.

<sup>28</sup> Office of the Chief Actuary, *The Long-Range Demographic Assumptions for the 2014 Trustees Report*, 2014. Section 3. Immigration p. 4.

<sup>29</sup> Trustees 2014, p. 82.

Figure 8. Net Immigration Estimates/Projections, Trustees 2015 Intermediate, 1980–2090



Source: 2015 Trustees Report, Table V.A1.

**“Other emigration”:** Meanwhile the 2015 Trustees’ projections assume substantial increases in “other emigration” over the projection period. This outcome is driven by the assumption that future departures are best represented by a nearly constant percentage from the pool of “other immigrants”—specifically assuming an emigration rate of 2.8 percent annually, declining slightly to 2.5 percent late in the projection period. Since other assumptions about “other immigration” result in a substantial growth in the projected pool of “other immigrants” (the stock as opposed to the flow), the result of applying this near-constant percent departure rate is a substantially increasing trend in annual emigration.

**“Net other immigration”:** Because the projections assume essentially constant annual volumes of “other immigration” while also assuming substantial increases in “other emigration,” the resulting projection from 2020 onward shows a long-term trend of substantial declines in “net other immigration.” From the 2015 estimate of 670,000 “net other immigrants,”<sup>30</sup> the intermediate projection assumes declines to 435,000 by 2025, 340,000 by 2040, and 290,000 by 2070. In percentage terms, these represent declines of about 50 percent by 2040 and just under 60 percent by 2070.

## Assessment of Methodology and Assumptions

In the Trustees’ 2015 immigration projections, most of the components are held constant or near-constant over the projection period. A notable exception is assumed declines in “net other immigration,” which drops by about 50 percent over 25 years from 670,000 (2015) to 340,000 (2040). As discussed, this decline is attributable primarily to the assumed increases in “other emigration” after 2022.

The projections based on these assumptions produce declining absolute levels of “net total immigration” (the sum of “net legal” and “net other”) in the intermediate projection from 1,465,000 in 2015 to 1,080,000 in 2090—a decline of over 25 percent over the projection period. As shown in Figure 8, the decline in projected net immigration is being driven primarily by the assumed declines in “net other immigration.”

Over the same period the U.S. population is projected to increase substantially. As a result “net total immigration” expressed as a proportion of the projected U.S. population would decline by well over one-half, from 4.05 to 1.76 per 1,000 population.

To what extent should these projected downward trends in “net total immigration” be considered possible, plausible, or likely for future decades? Certainly some arguments would support them. With respect to the large proportion of “other immigration” that is unauthorized/undocumented/illegal:

<sup>30</sup> As noted, a short-term “recovery” of “other immigration” is assumed, with a peak in 2018/19.



Table 5. Comparisons of Net Total Immigration Assumptions by SSA and Census Bureau for 2015–2060

	Net total, SSA Intermediate	Census 2014 projections	SSA less Census	SSA and Census Average
<b>2015</b>	1,465,000	1,241,000	224,000	1,353,000
<b>2020</b>	1,395,000	1,271,000	124,000	1,333,500
<b>2030</b>	1,190,000	1,355,000	-165,000	1,272,500
<b>2040</b>	1,135,000	1,426,000	-291,000	1,280,500
<b>2050</b>	1,110,000	1,473,000	-363,000	1,291,000
<b>2060</b>	1,095,000	1,495,000	-400,000	1,295,500
<b>2070</b>	1,085,000	1,515,000*	-430,000	1,300,000
<b>2080</b>	1,085,000	1,535,000*	-450,000	1,310,000

\*Note: Technical Panel extrapolations for years after 2060.

Sources: SSA projections from 2015 *Trustees Report*, Table 3.1, 2015. Census projections from U.S. Census Bureau, Table 1. *Projections of the Population and Components of Change for the United States, 2015 to 2060 (NP2014-T1)*.

- Enforcement of U.S. immigration laws could become more effective in future decades. Proponents of so-far unsuccessful legislative proposals for “comprehensive immigration reform” argue that their proposals include measures that would substantially enhance enforcement, and others have proposed legislation focused upon enforcement per se. However, the Trustees base their projections on “current law,” and hence any possible future legislative changes that would increase enforcement efficacy would not normally be included in their projections. In addition, we recognize that past immigration reforms, such as those enacted in 1986 and 2000, also were described as enhancing enforcement, yet the size of the unauthorized/undocumented/illegal pool increased substantially after their implementation.
- Economic and other incentives favoring out-migration from current primary source countries to the United States could decline over the projection period. In part this could be one effect of the substantial fertility declines that have taken place in Mexico, which after a lag of 20 or more years should result in slowing growth among the young adult cohorts that have the highest propensities to emigrate.

With respect to lawful immigration, whether with legal permanent residence visas (and hence counted as “legal immigration”) or in the form of temporary visas (and hence placed under the Trustees’ “other immigration” category):

- Some believe that global “competition” among destination countries will grow, especially for those who have developed knowledge and skills that are valued in advanced economies. This outcome, while possible, depends heavily upon trends in economic growth, technology, and other hard-to-predict elements.

- Expansion of temporary visas, whether “skilled” or not, has been driven by effective political advocacy by interest groups, often employers. It is possible that such advocacy efforts will decline over time, as employers find other ways to limit expenditures on their U.S. workforce (e.g. investment in labor-saving technologies, and offshore outsourcing of their activities to low-wage countries), but again this is virtually impossible to anticipate with any confidence.

While these and other changes are possible and would be consistent with the downward trends in net immigration assumed in the Trustees’ projections, they seem less plausible than several alternatives, such as:

- Increases in “net other immigration” might result from the recently-announced (though contested) 2014 executive actions to provide legal status to 4–5 million persons who are currently in unauthorized/undocumented/illegal status.
- Promised enhanced enforcement of immigration law may not occur, or even weaken under “current law,” as a result of administrative or judicial decisions.
- Whether or not emigration from current primary-source countries will decline as argued by some, additional “other migration” pathways may appear from source countries that are not currently the origin of large numbers of such migrants.
- Employers and their representatives may continue or strengthen their advocacy for expansions in temporary visas.
- Under the “legal immigration” category, the numerically-unlimited category of legal permanent residence visas for immediate family of U.S. citizens would

likely increase due to the feedback loops built into current law.

Given these plausible developments, the Technical Panel recommends that the Trustees increase their estimates of “legal immigration” and “net other immigration” for the intermediate projections. It is worth noting that the Census Bureau’s 2012 long-range immigration projections provided variants of net international immigration—“low,” “middle,” “high,” and “constant”—and that all of these variants (other than the “constant” variant, by definition) showed increases. The Panel is not suggesting that the projection assumptions of the Census Bureau are superior to those of the Social Security Administration—only that the projection series being produced by these two technically-proficient government agencies have become quite divergent (see Table 5).

### How Should the Trustees Project the Impact of “Executive Actions?”

The Trustees understandably prefer to base their projections upon “current law.” As can be seen from the accumulation of 10–11 million unauthorized migrants in the United States during the past two decades, current U.S. immigration law appears to be very difficult to enforce. Moreover, immigration outcomes also depend heavily upon decisions by both the executive and judicial branches that were not contemplated when controlling legislation was being adopted.

Uncertainties about the meaning of “current law” with respect to immigration have been thrown into sharp relief by “executive actions” announced by the Obama Administration in 2012 and 2014.<sup>31</sup> In the absence of Congressional agreement on proposed “comprehensive immigration reform,” the 2014 executive actions seek to provide temporary legal status to some 4–5 million persons currently living in the United States without legal authorization. These actions, in turn, have been vigorously challenged, and future outcomes remain clouded. Under these conditions, the Trustees are faced with a difficult decision as to whether executive actions announced by the Administration and affecting large numbers of would-be immigrants should, or should not, be considered part of “current law.”

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31 The Obama Administration’s 2012 executive action on immigration is known as “Deferred Action on Childhood Arrivals” (DACA) and permits certain undocumented immigrants who entered the United States before age 16 and before June, 2007 to receive renewable two-year work permits and exemption from deportation. The action was expanded in 2014 to include those who entered the United States before 2010 and eliminated a requirement that applicants be under 31 years of age. The 2014 executive action is known as “Deferred Action for Parents of Americans and Lawful Permanent Residents” or as “Deferred Action for Parental Accountability” (DAPA) and allows certain undocumented immigrants who have lived in the United States since 2010 and have children who are American citizens or lawful permanent residents to apply for a three-year, renewable work permit and grants exemption from deportation. A federal judge issued a temporary injunction on the enforcement of DAPA in February of 2015.

The Trustees decided in their 2015 report to treat both the 2012 and 2014 executive actions as “current law” in their projections. The Technical Panel would have included the 2012 action but would have deferred any inclusion of the more recent and larger executive actions announced in late 2014. The Panel understands that the 2012 actions have already been implemented, but that the 2014 actions have been challenged in both the courts and in Congress, and their implementation is currently suspended under a preliminary injunction issued by a Federal District Court. In late May 2015, an appeal by the executive branch seeking termination of this injunction was rejected by a panel of the 5<sup>th</sup> Circuit of Appeals. Evidently the legal status of the 2014 executive actions remains unclear.<sup>32</sup> Despite its reservations, the Technical Panel accepts the Trustees’ decision to include the 2014 executive action.

The Technical Panel further notes that, in the treatment of any executive action, the Trustees may also need to modify their overall immigration projections to reflect that:

- Such actions may result in substantial positive feedbacks upon future “legal immigration.”
- The numbers involved in the 2014 executive actions are large (4–5 million), but the announced actions are effective over a 2- or 3-year period after which they may or may not be renewed. Hence the beneficiaries of such actions presumably would not be shifted into the “legal immigrants” category since their status is not that of legal permanent residents.
- Beneficiaries of both the 2012 and 2014 executive actions, if ultimately implemented, would be eligible to receive Social Security numbers and work permits.<sup>33</sup>
- If a significant number of beneficiaries of executive actions ultimately are able to adjust their status to legal permanent residents (LPRs), they would shift from the Trustees’ category “other immigrant” to their “legal immigrant” category.
- If substantial numbers subsequently were to naturalize, they would become eligible to petition for legal permanent resident (LPR) visas for their immediate family members, without numerical limits, and so the projected numbers in this category would presumably need to be adjusted upward.

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32 As of May 31, 2015.

33 Past Trustee projections have assumed that Social Security benefits are not available to anyone who never had a “work-authorized SSN at some point in time.” However, the planned issuance of Social Security numbers to large numbers of beneficiaries of the announced executive actions would presumably require adjustments in projection assumptions regarding the numbers eligible to claim Social Security benefits. Social Security Administration, Office of the Chief Actuary, “Effects of Unauthorized Immigration on the Actuarial Status of the Social Security Trust Funds,” *Actuarial Note 151*, April 2013, p. 2.

## Presentation

The Technical Panel recommends that the Trustees ensure that all components of projected future immigration be presented in clear graphic form, in addition to the data tables that have been included in past reports. The Panel believes that graphs, such as Figure 8, would provide readers of the reports with a clearer understanding of the underlying assumptions and their effects over the projection period. The most obvious example is the fact that the downward trajectory of total net immigration projected in the Trustees' 2015 intermediate projection is driven by the combination of assumed constant levels of net legal immigration along with assumed declines in net other immigration. Such figures (which usefully could be extended back several more decades) would also show the erratic and unpredictable trajectories of U.S. immigration over the past half-century, thereby illustrating the difficulties faced by the Trustees in using trends from past decades as a basis for 75-year forward projections. The Panel also recommends the Trustees consider including graphics reflecting immigration projections produced by other Federal agencies, such as the Census Bureau, to highlight the uncertainties embodied in projections produced by professional analysts.

## A Humbling Record for Past Projections and Recommendations

The Technical Panel offers its recommendations against a humbling background of past efforts to project U.S. immigration. As mentioned earlier, the Census Bureau in 2009 found it necessary to substantially revise the long-range projections of U.S. demography that it had published only one year earlier. Census had based its assumptions on the 31-year historical trend in immigration up to 2003, but by 2009 data from the *American Community Survey* made it clear that the immigration trends assumed on the basis of such historical data were much too high. As a result of the revision to the immigration assumptions, Census projections of the U.S. population in 2050 were substantially different from those produced only a year earlier.<sup>34</sup>

Such experiences led the Census Bureau to completely change the methods and assumptions used in subsequent projections of U.S. immigration. Instead of assuming continuation of past immigration patterns, it developed its revised projections of future annual immigration by shifting "the perspective from the receiving nation [United

States] to the source countries by incorporating information on the trends in population in sending countries." First, it estimated immigration numbers to the United States over 1980–2011 for six "country of birth groupings."<sup>35</sup> For each of these regional groupings it then calculated "emigration rates" by dividing the region's 1980–2011 U.S. immigration estimates by the region's overall population for the same years. Using these historical emigration rates by sending region, it then projected forward to 2060 a single series of net international migration to the United States, using a linear power function.<sup>36</sup>

It remains to be seen whether this methodological shift by the Census Bureau toward basing its U.S. immigration projections upon demographic trends in sending countries will prove superior to the methods that proved so unsatisfactory in the recent past. At least two obvious questions are apparent: First, is it reasonable to assume that past patterns in the average emigration rate for a set of source countries between 1980 and 2011 will continue through 2060? Or will economic and political developments in such regions and countries or fluctuations in U.S. enforcement lead to changes in such emigration rates? Second, how well will the new method perform if the primary source countries and regions for U.S. immigrants change over time?

The Technical Panels of 2003, 2007, and 2011 all identified some problems with the methods being used to project future immigration in Trustees reports and offered a number of recommendations.

The 2003 Technical Panel suggested that the Trustees simply assume a future growth rate for net immigration. Drawing upon evidence from the past, they recommended this rate be set at one-half the projected growth rate for the total population. When compared with subsequent data, this assumption does not appear to have been a promising one.

The 2007 Technical Panel recommended that the Trustees assume that net total immigration was about 1,350,000 in that year, and that this number would increase by 1 percent per year for 25 years. This assumption has the virtue of simplicity, but implied that by 2014 net total immigration would have been about 1,450,000, which most data suggest did not take place. Of course part of this might have been related to the Great Recession that ensued after 2007, which the 2007 Technical Panel could not have foreseen.

34 U.S. Census Bureau, 2009, "Methodology Statement for the 2009 National Projections," p. 2. <http://www.census.gov/population/projections/files/methodstatement09.pdf>

35 Mexico; Latin America/Caribbean/South America; Asia; Sub-Saharan Africa; Near East/North Africa; Europe/Canada/Oceania.

36 U.S. Census Bureau, 2014, "Methodology, Assumptions, and Input for the 2014 National Projections," <https://www.census.gov/population/projections/files/methodology/methodstatement14.pdf>, pp. 9–10

Figure 9. Prevalence of SSDI Receipt: Worker Beneficiaries per 1000 Insured, 1975–2014



Source: Data provided by the Office of the Chief Actuary, based on 2015 *Trustees Report*.

The 2011 Technical Panel recommended an entirely different approach to projecting U.S. net total immigration—that net total immigration in the future be projected simply as a constant percentage of the overall U.S. population. Its recommended “intermediate” assumption for this approach was 3.2 per 1000, a number estimated from long time-series data—a 110-year series (1900–2010), and a 190-year series (1820–2010). While such a number may be a reasonable average for the past centuries, the basis for assuming that it would continue for 75 years into the future was not very compelling.

Over the past two centuries, U.S. net immigration has fluctuated greatly, peaking in the decades around the turn of the 20<sup>th</sup> Century, followed by deep nadirs during the 1930s and 1940s, followed by generally rising but erratic trends in subsequent decades. The unsatisfactory outcomes of the Census Bureau’s assumptions in its 2008 projections, discussed above, were based on the 31-year historical record, and suggest a need for caution in assuming that long-run past trends in immigration can be used as a basis for long-range projections.

In short, this Technical Panel does not see any easy solutions emerging from other agencies or from past Technical Panels.

## 1.4 Disability

**Assumption Recommendation 1.** The Technical Panel accepts the Trustees’ current assumptions regarding DI incidence, specifically, an intermediate age-sex-adjusted incidence rate of 5.4 awards per 1,000 exposed, with low-cost and high-cost values of 4.3 and 6.5 awards per 1,000 exposed. Because the incidence rate appears to be undergoing rapid and, perhaps, unexpected changes, it will be important to closely monitor its evolution as experience accumulates.

**Assumption Recommendation 2.** The Technical Panel recommends lowering the intermediate, high-cost, and low-cost assumptions for the DI recovery rate from 10.4 to 10.1 recoveries per 1,000. We recommend symmetric reductions to the low-cost and high-cost rates: from 12.6 and 8.3 recoveries per 1,000 respectively to 12.3 and 8.0 per 1,000.

**Assumption Recommendation 3.** Accounting for the stabilization of the disability composition of the SSDI population and the adjustments to mortality estimates incorporated by the Trustees since the prior Technical Panel’s report, this Technical Panel is comfortable with the Trustees’ current mortality assumptions for DI beneficiaries.

**Method Recommendation 1.** Given the complex and rapid changes in labor force participation rates among both sexes, and the difficulty of fully distinguishing the short- and medium-run effects of the Great Recession from the long-run effects of shifting labor demand and evolving social norms and preferences (as discussed in the Labor Force section), the Technical Panel recommends continued close study of the evolution of insured rates for both sexes. Given this uncertainty, and its consequences for program evolution, the Technical Panel further recommends maintaining a fairly wide confidence band around these estimates.

**Method Recommendation 2.** The Technical Panel recommends exploring in greater depth the recent changes in DI allowance rates to better understand whether recent declines are due entirely to cyclical factors (as per OCACT Actuarial Note #153), or whether other programmatic factors may be at work.

### The Drivers of the DI Program

OCACT estimates the number of individuals receiving DI benefits in future years in four steps. First, it projects the number of males and females in each age group. Second, it projects the share of males and females in each age group insured for DI benefits. A person must have worked in at least 5 of the 10 most recent years to be eligible for DI benefits. Third, it projects the incidence rate—the fraction of individuals in each age group insured for DI who are awarded benefits during the year. Fourth, it projects the termination rate for men and women in each age group who receive DI. Individuals exit the DI program for three main reasons: conversion to retired worker benefits at full retirement age; death; and recovery. The projections of the 1) population size; 2) fraction of the population that is DI-insured; 3) incidence rate; and 4) termination rate in each age group drive the projections of DI enrollment among men and women. Changes in any one factor translate directly into changes in the projected size of the program.

### Historical Background

Some background is necessary to understand why the fraction of non-elderly adults receiving SSDI benefits has increased substantially over the past thirty years, and why this increase is likely to be considerably slower in the years ahead.

Following its inception in 1956, SSDI prevalence rose steadily over the next twenty years, reaching a high water mark in 1977. It then fell sharply between 1977 and 1984, rose modestly from 1984 through 1989, and then experienced a steep and continuous rise for the next 24 years, leveling off in 2013 (see Figure 9). The prevalence rate for women used to be much lower than the rate for men. But, during this 24-year period, the two rates rapidly converged. In 1984, approximately one and a half non-elderly males were receiving SSDI for every non-elderly female; by 2008, this ratio was close to parity.

Several forces account for these marked changes in the relative size and sex composition of the SSDI beneficiary population.<sup>37</sup> During the late 1970s, concern over swelling disability rolls spurred the Social Security Administration (SSA) to tighten medical eligibility criteria and exercise greater control over the state Disability Determination Service (DDS) offices.<sup>38</sup> The fraction of applicants awarded benefits (the “award rate”) fell from 45 percent in 1976 to 32 percent in 1980. Augmenting this administrative action, Congress passed legislation in 1980 mandating that SSA conduct more frequent beneficiary health reassessments (Continuing Disability Reviews or CDRs). In the subsequent three years, SSA determined that 40 percent of cases reviewed no longer met medical standards and terminated their benefits.<sup>39</sup> Congress also required SSA to further tighten medical criteria, accelerating the decline in award rates. This large-scale curtailment of benefits, occurring during the deepest postwar U.S. recession, was met with intense public criticism. Citing violations of due process, seventeen states refused to comply with the DI review effort during 1983 and 1984.

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37 These forces have been detailed recently in Liebman (2015) and in earlier work by Autor and Duggan (2003, 2006) and Kearney (2005/2006).

38 The discussion of the SSDI program clampdown and subsequent reforms is drawn from Autor and Duggan (2003, pp. 161–162).

39 Rupp and Scott (1998).



Responding to the backlash, Congress passed legislation in 1984 that altered the disability determination system, yielding a broader definition of disability and providing applicants and medical providers with greater opportunity to influence the decision process.<sup>40</sup> Contemporaneously, CDRs came to a near halt. In the five years from 1985 through 1989, SSA terminated fewer individuals than it had in the first five months of 1982.

The 1985 Congressional reforms set the stage for subsequent growth of the SSDI program—although it was hardly the only factor, as discussed below. After adjusting for the impact of both age composition and the U.S. unemployment rate, the incidence of disability enrollments rose substantially between 1982 and 1992.<sup>41</sup> After 1992, the adjusted incidence rate stabilized among men, but continued to rise among women throughout the 1990s and 2000s, albeit at a much more modest clip than in the 1980s.

Although the rise in SSDI *incidence* slowed for females and reached a plateau for males in the early 1990s, the

*prevalence* continued to rise steeply over the subsequent two decades for three reasons. First, SSDI *incidence* is a measure of *inflows* into the SSDI program; by contrast prevalence—the number of current beneficiaries—is a stock. The stock of beneficiaries is said to be in “steady-state” when inflows equal outflows. When inflows exceed outflows, the stock of beneficiaries rises. If starting from an initial steady state, incidence rises—as it did between 1982 and 1992—the stock of beneficiaries does *not* immediately reach a new steady state. Instead, this stock will typically grow for multiple years until the program reaches a new size where outflows again equal inflows. Thus, a discrete rise in SSDI incidence will generate many years of program growth *after* incidence has stopped rising.<sup>42</sup> Liebman (2015) estimates that the post-1985 rise in SSDI incidence accounted for half (51 percent) of the rise in SSDI prevalence from 1985 to 2007 (see Figure 10).

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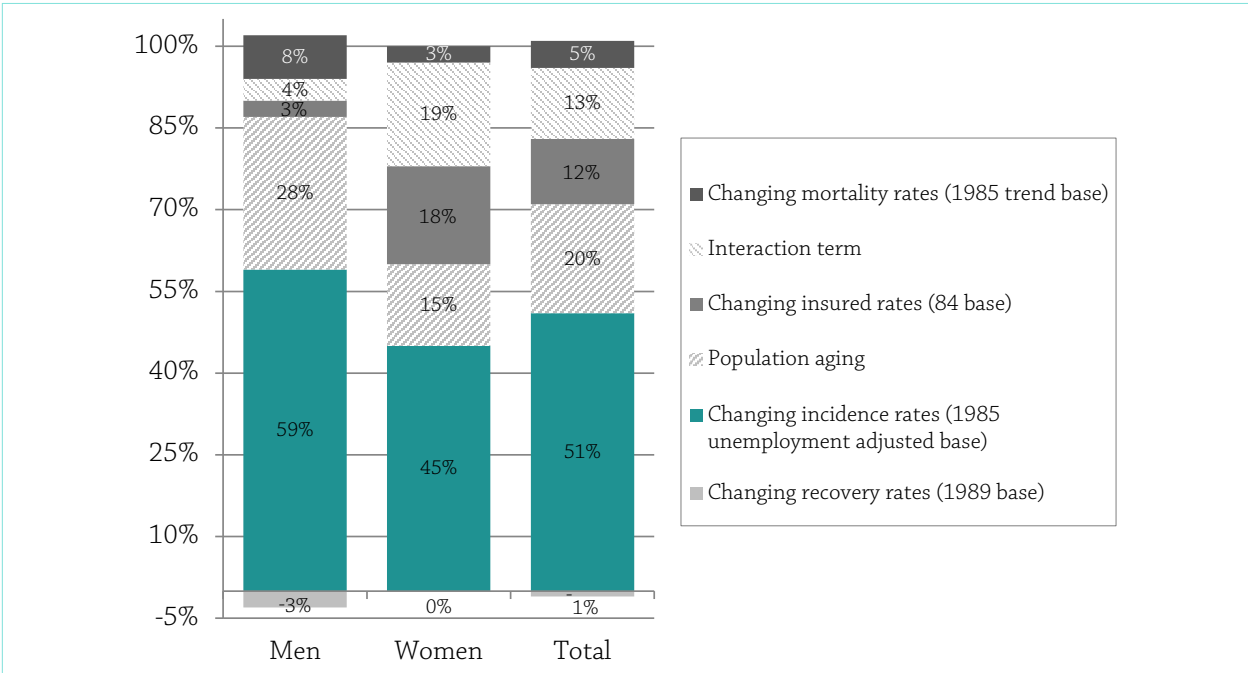
40 SSA was required to 1) relax its strict screening of mental illness by placing less weight on diagnostic and medical factors and relatively more on functional factors, such as ability to function in a work or work-like setting; 2) consider source evidence provided by the applicant's own health care provider prior to the results of SSA consultative examination; 3) give additional weight to pain and related factors; 4) consider multiple non-severe impairments as constituting a disability during the initial determination (whereas prior to 1984, applicants were automatically denied awards during the initial determination if all impairments were judged to be non-severe); 5) desist from terminating benefits for any individual for whom SSA could not demonstrate substantial evidence of medical improvement; 6) provide benefits for those former recipients whose terminations were under appeal; and 7) suspend Continuing Disability Reviews (CDRs) for mental impairments and pain until appropriate guidelines could be developed. In 1991, due to successful court challenges to SSA's treatment of source evidence, regulations were adopted placing further weight on the information provided by an SSI or DI applicant's own medical provider.

41 Liebman (2015).

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42 Outflows from the program are the product of the current stock and the exit rate. Assuming the exit rate is roughly constant (which is roughly true for the past several decades), outflows from the program rise as the stock of current beneficiaries grows. When inflows rise due to an increase in the incidence rate, the stock of beneficiaries rises as well. But it does not rise indefinitely. As the stock grows, the number of beneficiaries exiting annually rises along with it. When the stock is sufficiently large that exits are again equal to inflows, the program is back in steady state—but now with a larger stock of beneficiaries. The number of years required to reach a new steady state depends on the magnitude of the incidence change relative to the program's exit rate. A steep rise in incidence can take a decade or longer to work through.

Figure 10. Decomposition of Various Factors' Impact on the Percent of the Working-Age Population Receiving Disability Insurance, 1985–2007



Source: Liebman (2015).

The next largest factor was population aging. When the Baby Boom began aging into their peak disability years in the mid-1990s, population aging became a central force driving rising SSDI prevalence. Liebman (2015) estimates that population aging accounted for 20 percent of the rise in prevalence between 1985 and 2007, and 46 percent of the rise in prevalence over the shorter 1993–2007 interval. Furthermore, the earlier rise in SSDI incidence magnified the subsequent impact of population aging. In effect, the baby boom generation ‘aged into’ higher incidence rates than had prevailed ten years earlier. Liebman (2015) estimates that the interaction between rising incidence and population aging explains an additional 13 percent of the rise in prevalence between 1985 and 2007.

The third key factor in the growing SSDI rolls is the rapid convergence of female SSDI prevalence towards that of men. One contributor to this convergence is the secular rise in female labor force participation, which increases

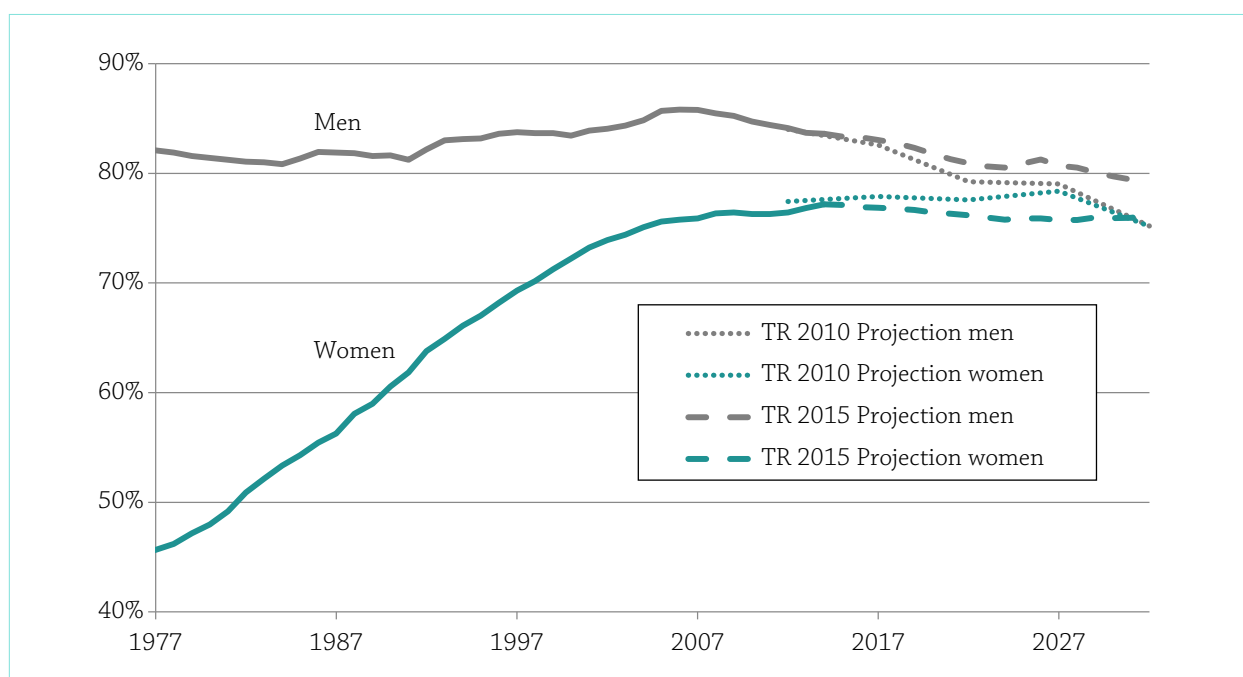
the fraction of women eligible by their work history to receive disability benefits. Liebman (2015) reports that the fraction of women ages 50 to 64 covered by SSDI rose from 46 percent to 72 percent between 1980 and 2007, which explains 18 percent of the increase in SSDI prevalence among women between 1985 and 2007. Surprisingly, rising insured rates played a considerably smaller role for women than did rising incidence; incidence explains 45 percent of the rise in female SSDI prevalence in the same interval, two-and-a-half times as large as the contribution of insured rates.<sup>43</sup>

Thus, SSDI growth over the last three decades was driven by three central factors: rising incidence (e.g., following the 1984 Congressional reforms), population aging, and female ‘catch-up’ in SSDI incidence. The interaction between rising SSDI incidence and subsequent population aging also plays an important role. Perhaps surprisingly, changing mortality and recovery rates make only a trivial contribution.<sup>44</sup>

43 As noted above, female SSDI incidence continued to inch upward throughout the 1990s and 2000s, distinct from the pattern of leveling off observed for males. One reason why this may have occurred is that rising female employment and earnings increased *both* the fraction of women insured for disability and the size of the cash benefit for which they were eligible in the event of disability (since benefit payments are an increasing function of prior earnings). All else equal, higher cash benefit levels would be expected to increase the fraction of insured women claiming benefits.

44 This point is also underscored by Autor and Duggan (2006) and Duggan and Imberman (2009).

Figure 11. Percentage Insured for DI, Men and Women, Ages 50–54: 1977–2032, by Year of Projection, 2010 vs. 2015



Source: Data provided by the Office of the Chief Actuary, based on 2015 Trustees Report.

The factors that led to the secular rise in SSDI prevalence over the past three decades are not likely to occur again, meaning that a further rise in SSDI prevalence is not inevitable. Indeed, two recent developments strongly hint that the trajectory of the program is already shifting rapidly. First, in 2015 the SSDI program appears poised to notch its first year-over-year decline in the stock of beneficiaries in more than 30 years.<sup>45</sup> Second, SSA data document an unusually steep and prolonged decline in SSDI allowance rates since 2000, particularly allowances granted at the appeal level. While this decline may in part reflect the impact of the Great Recession (since SSDI application rates typically rise and allowance rates typically fall during an economic downturn), the Technical Panel suspects that a regime shift in the SSDI adjudication process may be underway.<sup>46</sup> If this inference is correct, the SSDI rolls will decline further than current projections would suggest.

## DI Assumptions and Technical Panel Recommendations

The following section assesses each of the Trustees' assumptions that drive the DI projections and offers the Panel's recommendations.

### Percent Insured

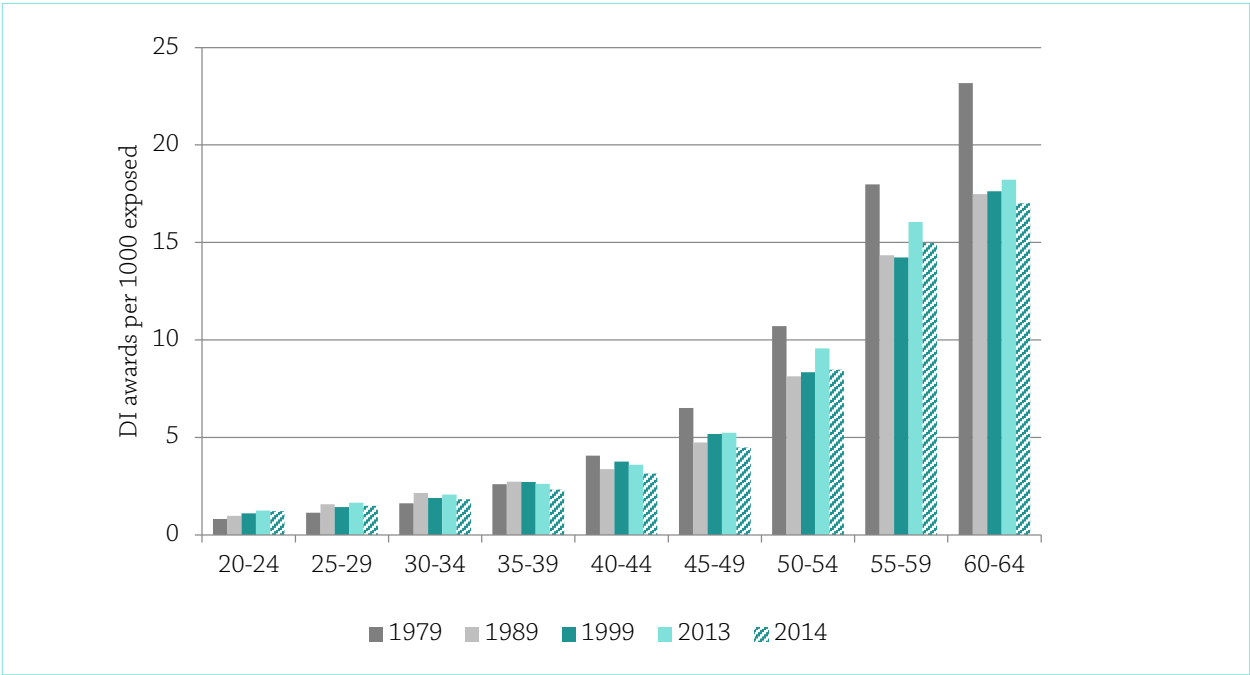
The percent of individuals insured has changed over time. Most notably, the increase in female labor force participation in recent decades has led to a steady rise in the fraction of women insured for DI (see Figure 11). The share of women who are DI-insured is projected to decline by 1.4 percentage points between 2014 and 2027, and then to rebound modestly to 76.2 percent between 2027 and 2032. The projection partly reflects the Trustees' assumptions that female labor force participation will not change much in the years ahead, but it may also reflect an increase in the projected share of other-than-legal immigrants in this group, who are much less likely to be insured.

<sup>45</sup> The number of SSDI beneficiaries in current payment status fell very slightly in 2014 Q4 and 2015 Q1 and rose very slightly in 2015 Q2, the last period for which data are available. (<http://www.ssa.gov/OACT/STATS/dibStat.html>, accessed 6/7/2015).

<sup>46</sup> SSA OCACT Note #153 (August 2013) ascribes this decline entirely to the counter-cyclical of SSDI application rates and pro-cyclical of allowance rates. The Technical Panel is not entirely persuaded by this evidence.

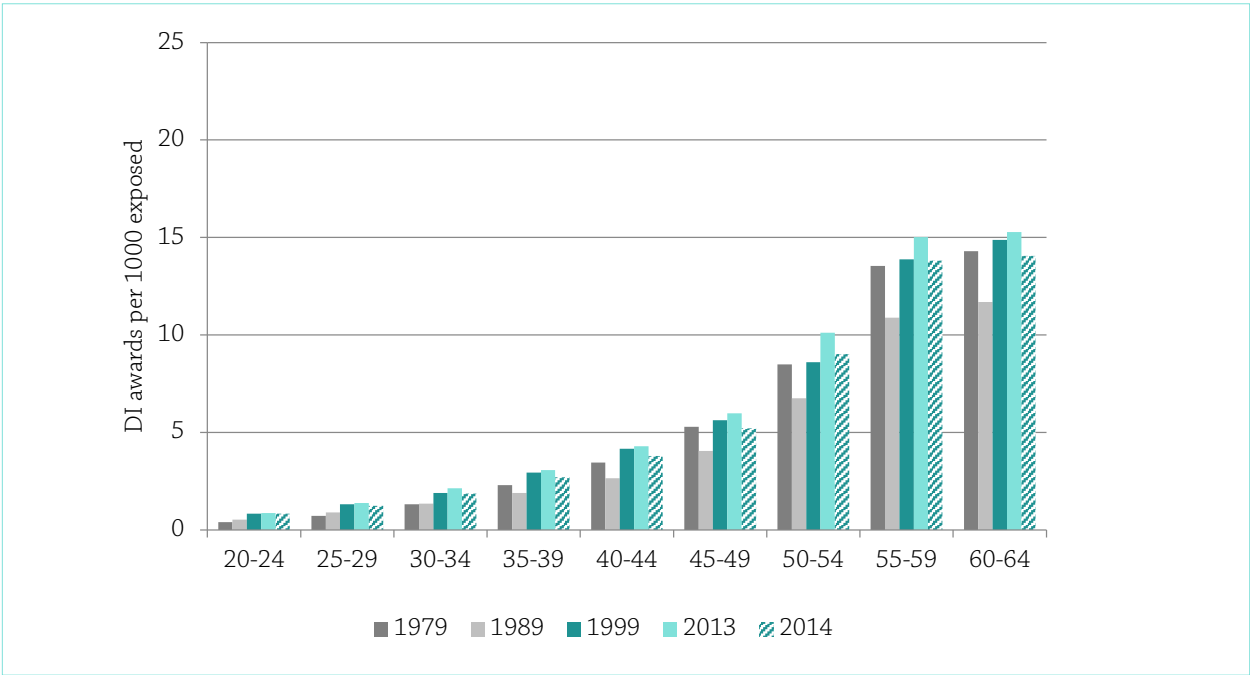


Figure 12A. SSDI Incidence per 1,000 Exposed, Men Ages 20–64



Source: Data provided by the Office of the Chief Actuary, based on 2015 Trustees Report.

Figure 12B. SSDI Incidence per 1,000 Exposed, Women Ages 20–64



Source: Data provided by the Office of the Chief Actuary, based on 2015 Trustees Report.

The share of men aged 50–54 insured for DI, which has gradually increased since the early 1980s, only to fall modestly between 2007 and 2014 (likely due to the Great Recession), is projected to fall another 4 percentage points in the coming decades (see Figure 11). The *Trustees Report* does not discuss this substantial change. The projections for other age groups among both men and women are qualitatively similar, with a leveling off projected for women and substantial declines projected for men (before a rebounding to gradually increasing rates after 2030).

Given OCACT’s methodology, the assumed declines in the share of DI-insured reduce the number of individuals projected to receive DI benefits. The 2011 Technical Panel recommended (Method Recommendation M-9) that the Trustees expand the discussion of the factors leading to the projected decline and carefully monitor developments to see if the recent declines among younger men carry forward to men at older ages. OCACT accepted this recommendation, and the 2014 and 2015 *Trustees Reports* made a modest upward revision to projected male insurance rates. The Reports also included a modest downward revision to projected female insurance rates, partly to accord with the fact that realized female insurance rates in 2012 fell below the level projected by the 2010 *Trustees Report*.

Given the complex and rapid changes in labor force participation rates among both sexes, and the difficulty of fully distinguishing the short- and medium-run effects of the Great Recession from the long-run effects of shifting labor

demand and evolving social norms and preferences (as discussed in Chapter 3), the Technical Panel recommends continued close study of the evolution of insured rates for both sexes. Given this uncertainty, and its consequences for program evolution, the Technical Panel further recommends maintaining a wide confidence band around these estimates.

### Incidence Rates

Incidence rates are a critical determinant of projected DI enrollment. Although the administration of the SSDI program and the state of the economy both affect incidence rates, the most important determinant is the age structure of the population. Holding constant both the size of the working-age population and the SSDI incidence rate at each age, an increase in the fraction of working-age adults who are ages 50 and above has a dramatic effect on aggregate SSDI incidence because age-specific incidence rates rise steeply with age. Figure 12A shows the pattern for men; Figure 12B shows a similar pattern for women.<sup>47</sup>

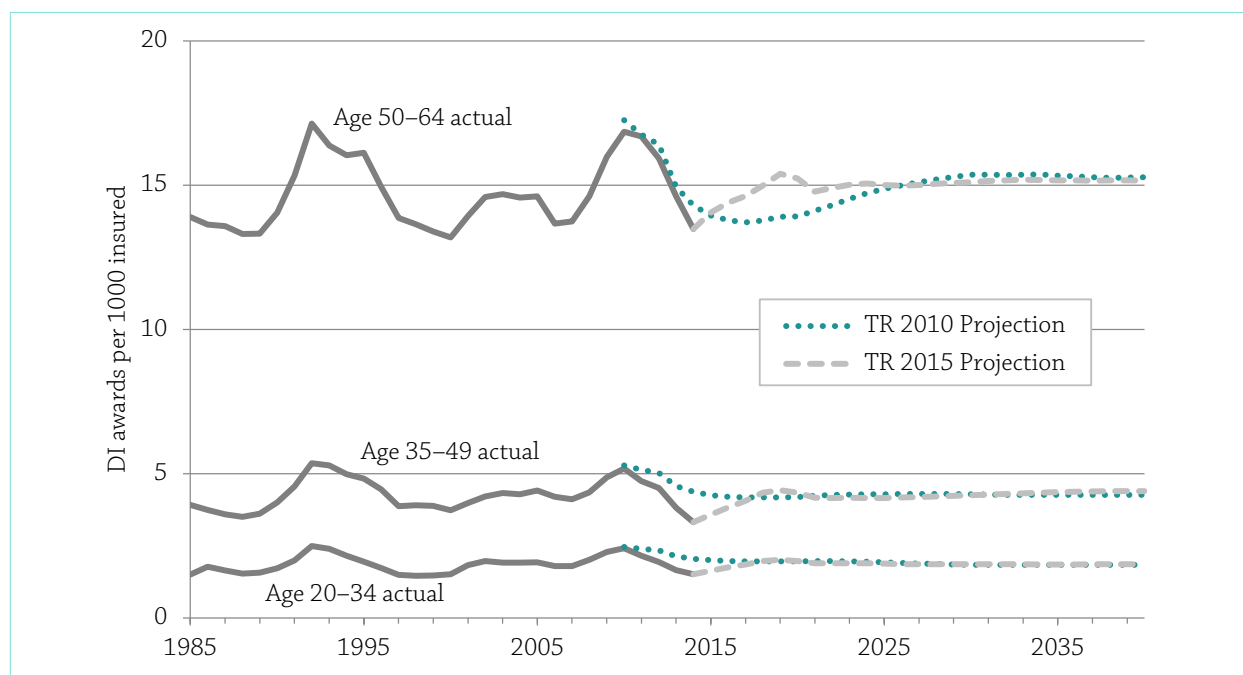
Incidence rates are also highly cyclical (see Figures 13A and 13B).<sup>48</sup> The incidence rate for both men and women rose substantially from 1989 to 1992, a period encompassing the 1991 recession, in the early 2000s, and again from 2007 to 2009 during the Great Recession. As the recession abated between 2010 and 2013, incidence rates for men and women returned to the levels seen in 2000 (35–49 year old men fell to a level lower than at any time since 1985).

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47 1979, 1989, and 1999 are all business cycle peaks, which generally correspond to low incidence rates. We use 2013 and 2014 (the latest year available) rather than 2009 to avoid the lingering effects of the Great Recession on SSDI incidence.

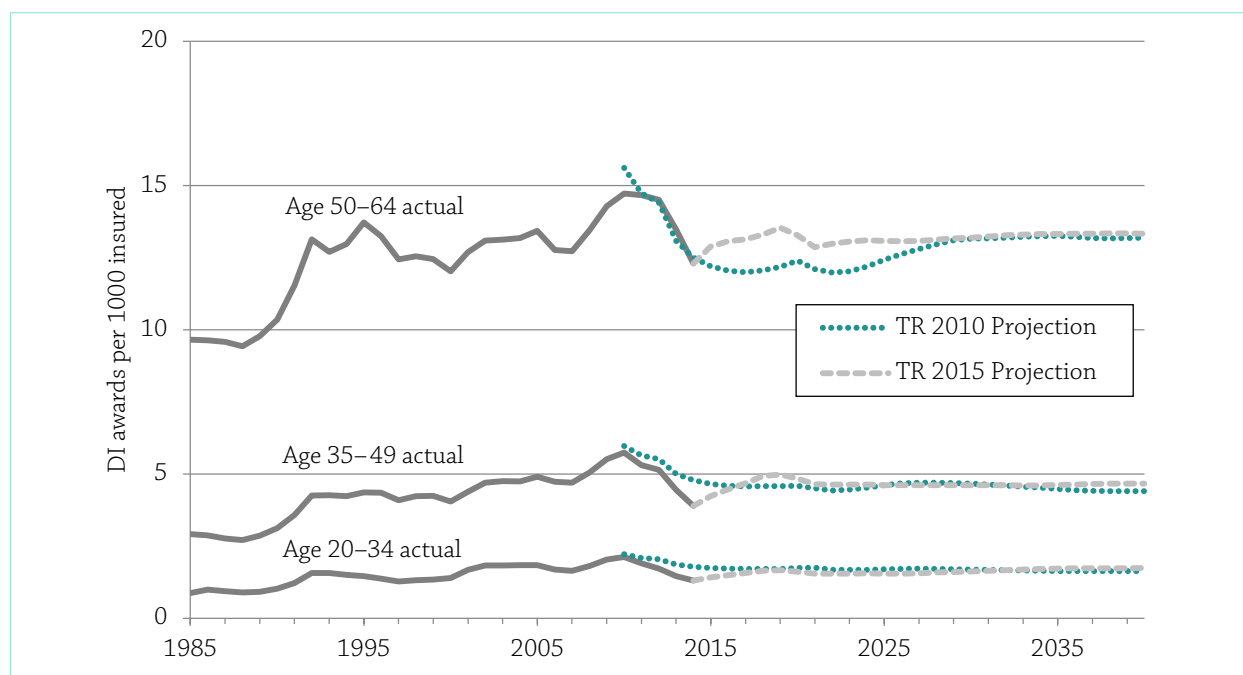
48 A number of researchers have identified this cyclical pattern; see Black, Daniel, and Sanders (2002); Autor and Duggan (2003); Duggan and Imberman (2009); and Liebman (2015).

Figure 13A. DI Incidence (per 1000 insured) among Men, by Age Category, 1985–2040 Projected in 2010 vs. Projected in 2015



Source: Data provided by Office of the Chief Actuary, based on *Trustees Reports 2010* and *2015*.

Figure 13B. DI Incidence (per 1000 insured) among Women, by Age Category, 1985–2040 Projected in 2010 vs. Projected in 2015



Source: Data provided by Office of the Chief Actuary, based on *Trustees Reports 2010* and *2015*.

In reviewing the incidence data through 2009, the 2011 Technical Panel recommended increasing the age-sex-adjusted disability incidence rate (the incidence rate if the population proportions by age and sex were the same as in the base year) from 5.2, which was assumed in the 2011 *Trustees Report*, to 5.8 per 1,000 insured workers, with somewhat larger increases for women and smaller increases for men. Responding to this input, the Trustees in 2013 raised the age-sex-adjusted disability incidence rate to 5.4 per 1,000 insured workers, a projection that was maintained in the 2014 and 2015 *Trustees Reports*.

Notably, realized incidence rates between 2010 and 2014 declined slightly *faster* from their Great Recession levels than the Trustees had projected for all groups except women ages 50–64 for whom experience tracked the 2010 projections closely. The projections from the 2015 *Trustees Report* anticipate a slight *increase* in incidence among both sexes and all three broad age brackets during the years 2014–2019. As explained in the Report, the Trustees assume that the Great Recession accelerated some DI enrollments that would otherwise have occurred a few years later, yielding the *opposite* of a backlog in the recession’s wake. If so, this temporary depression of DI incidence is likely to be both modest and brief. Given the evolution of DI incidence since the prior Technical Panel reviewed DI program data—and particular the sharp decline in allowances discussed immediately below—this Technical Panel accepts the Trustees’ current assumptions regarding DI incidence, specifically, an intermediate age-sex-adjusted incidence rate of 5.4 awards per 1,000 exposed,

with low- and high-cost values of 4.3 and 6.5 awards per 1,000 exposed. Because the incidence rate appears to be undergoing rapid and, perhaps, unexpected changes, it is important to closely monitor the evolution of incidence as experience accumulates.

### Allowance Rates

Changes in the total allowance rate of SSDI applicants, which is equal to the fraction of all initial DI claimants who are ultimately allowed benefits (excluding applicants disqualified for non-medical reasons, such as not being DI-insured), may substantially impact DI incidence in the years ahead.<sup>49</sup> The total allowance rate is generally countercyclical: DI applications increase when the unemployment rate rises but the allowance rate generally falls after a one- to two-year lag, likely because a larger share of applications filed during a recession is spurred by financial hardship rather than medical disability.<sup>50</sup>

Since 2001, however, the allowance rate has declined steadily (see Figure 14). A sustained reduction in allowance rates has the potential to dampen long-term DI incidence and prevalence. In addition, a decline creates a subtle but potentially important feedback between the allowance rate and the application rate: when DDS offices tighten eligibility criteria, both allowances *and*, ultimately, applications fall as potential applicants are discouraged from seeking benefits.<sup>51</sup> This interaction was particularly evident during the major retrenchment of DI determinations during the late 1970s and early 1980s.<sup>52</sup>

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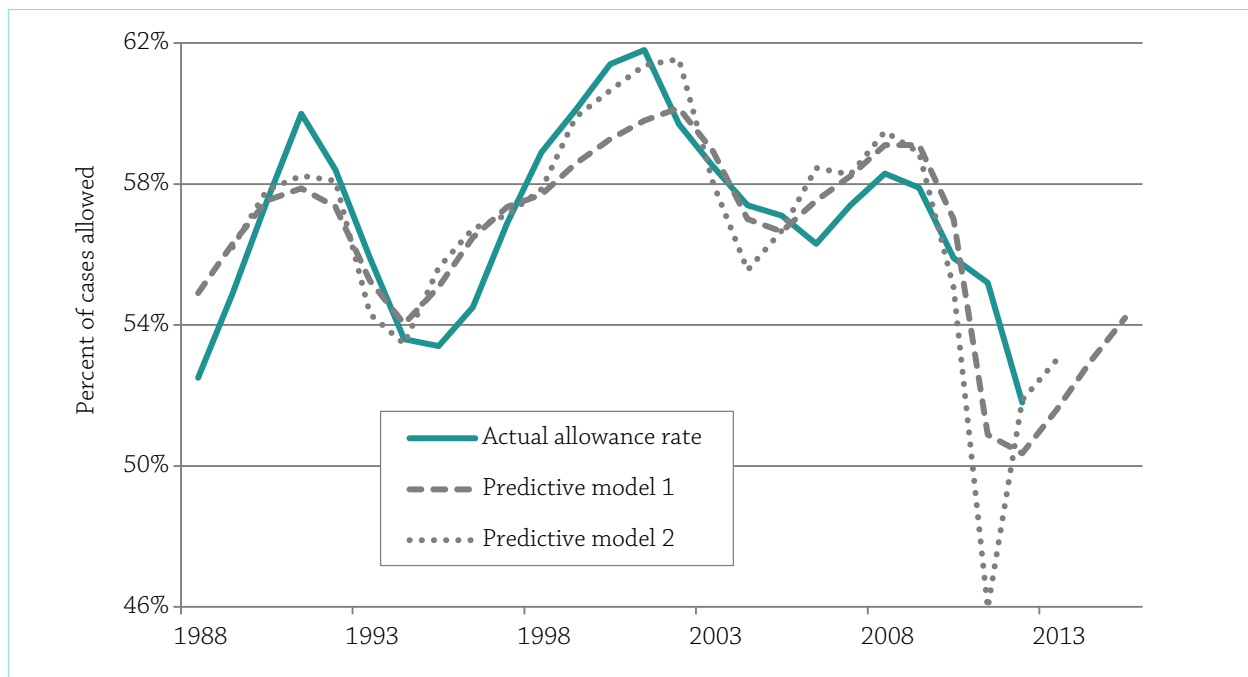
49 OCACT Actuarial Note #153 defined the total allowance rate as “all allowances made for claims filed in each year at the Disability Determination Services (DDS), both initial and reconsideration determinations, as well as allowances made for those claims on subsequent appeals. Rates are expressed as a percent of initial claims received at the DDS after screening for disability insured status and other non-medical criteria, generally at the time of receipt of claim at Social Security field offices.”

50 Although the allowance rate normally falls during an economic downturn, this pattern does not fully offset the rise in applications: as Figure 13 underscores, the net effect of economic downturns on DI incidence is generally strongly positive.

51 See Autor and Duggan 2003.

52 Between 1977 and 1983, the fraction of DI applicants awarded benefits fell from 46.1 percent to 30.6 percent. (These statistics, from Table 26 of the 2000 *Annual Statistical Report on the Social Security Disability Insurance Program*, include both medical *and* non-medical determinations and hence are not directly comparable to the total allowance rate reported in OCACT Actuarial Note #153). One might speculate that the falling allowance rate was spurred by a surge in economically-motivated DI applications stemming from the deep early 1980s U.S. recession. But no such surge occurred: applications per 1,000 insured fell from 14.1 to 9.8 in the same six-year period. It appears instead that the tightening of disability determination criteria during these years reduced the allowance rate and deterred applications.

Figure 14. Total Allowance Rate for Disabled-Worker DDS Claims by Filing Year, Actual Vs. Modeled



Source: OCACT Actuarial Note No. 153, August 2013.

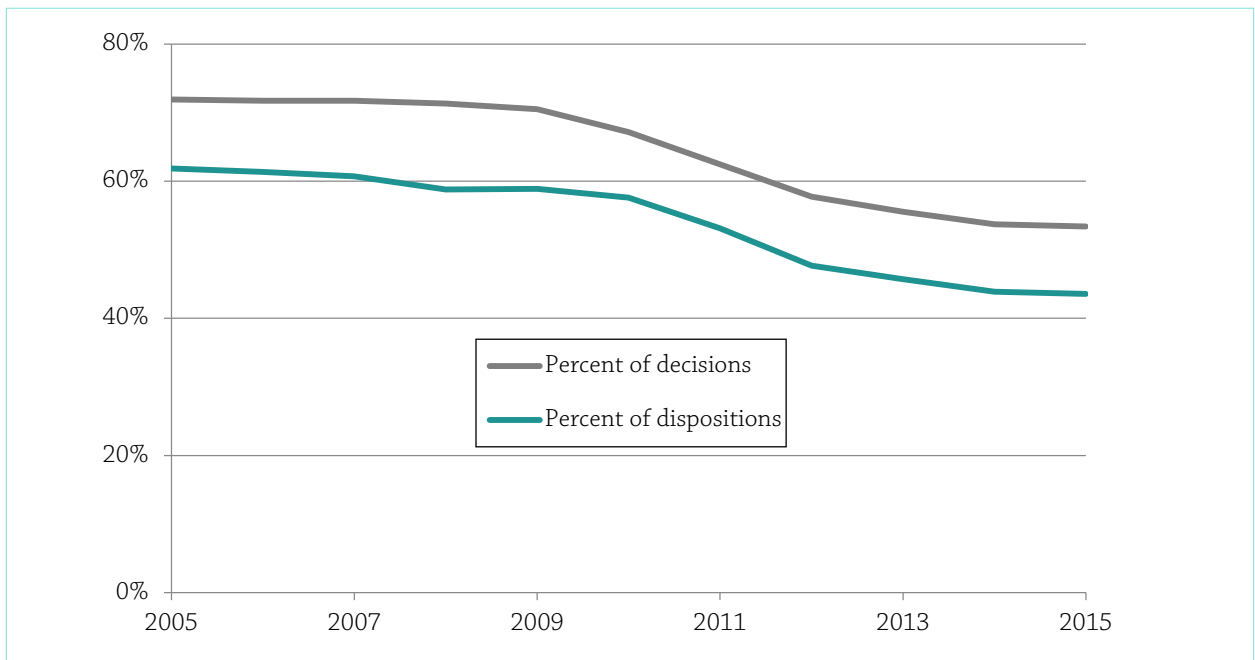
The relevant question for the Technical Panel, and for SSDI projections, is whether the substantial decline in final allowance rates since 2001 indicates a regime shift or merely a particularly steep and prolonged, but ultimately cyclical, fall in allowances. OCACT Actuarial Note #153 offers one answer to this question. Fitting a pair of time-series regression models that relate total allowance rates to lagged values of the U.S. unemployment rate and, potentially, lagged values of the allowance rate itself, OCACT draws the conclusion that the general decline in allowance rates seen since 2000, and particularly after 2009, is attributable to fluctuations in the unemployment rate rather than changes in the DI determination process.

The Technical Panel is not entirely convinced by this conclusion. The good fit of OCACT's model is in part a reflection of the fact that it makes an *in-sample* prediction—that is, it does not extrapolate to outcome years that were not used to produce the original regression line. Even given this fact, shortcomings are apparent. First, this model generally *under-predicts* the cyclical fluctuations of the total allowance rate in the 1988 through 2002 period, and then *over-predicts* this relationship after 2002. This pattern suggests that the downward trend in total allowance rates may in part be explained by secular declines in allowance rates rather than cyclical fluctuations. Second,

the predictive model implies a very sharp rebound in total allowances over 2012–2015, reflecting the lagged effect of the falling unemployment rate. Whether this prediction will prove accurate is unknown at present, but it highlights that the program is currently operating in a realm of very low total allowance rates that, if maintained for a couple of additional years, would almost certainly indicate a regime shift.

A final piece of evidence hinting that a regime shift may be underway in DI adjudications is given by Figures 15A and 15B. Figure 15A shows that since 2009 the percent of cases approved by Administrative Law Judge has fallen steeply with some evidence of a leveling off in the first half of 2015. Figure 15B plots mean Administrative Law Judge (ALJ) allowance rates by ALJ cohort, that is, the year in which the ALJs began their service. For example, the 2009 cohort includes those judges who were hired (or first began deciding cases) in 2009 and remain in service through 2014, and similarly for subsequent years. The data indicate that for all cohorts of ALJs, approval rates have declined year over year ever since 2009. Although allowance rates generally fall as ALJs gain experience, Figure 15B shows that more recent cohorts of ALJs have lower allowance rates than did earlier cohorts *with the same level of experience*.

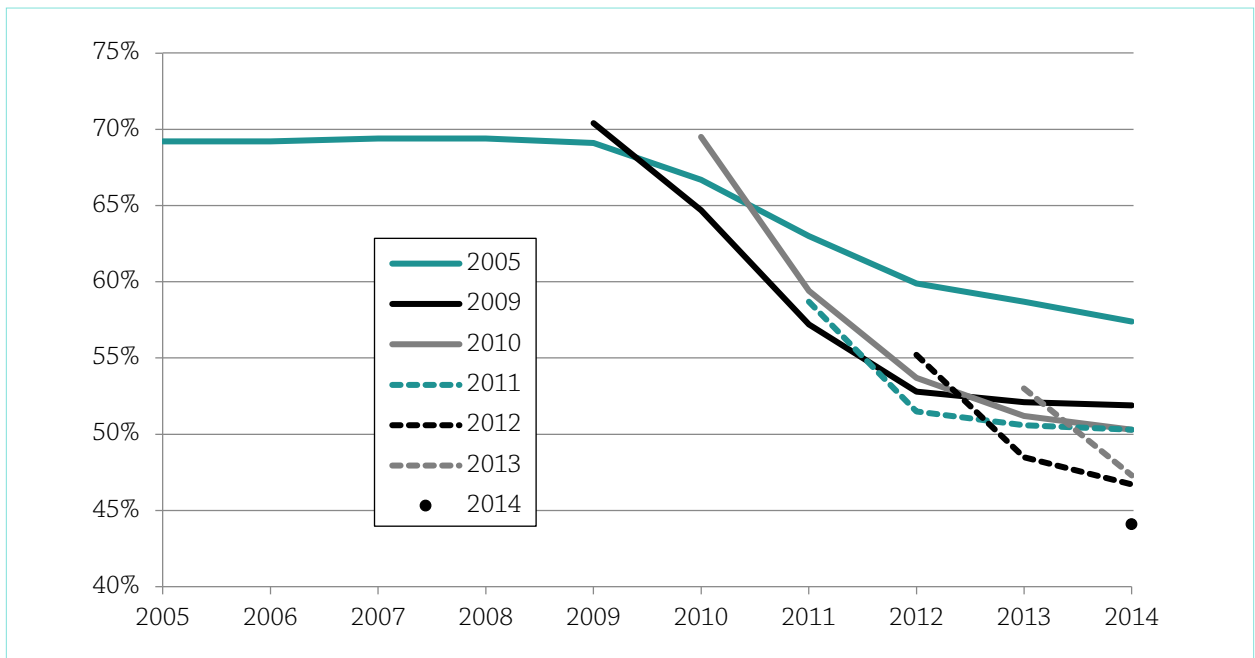
Figure 15A. Allowance Rate for Cases Decided by Administrative Law Judges, 2005–2015 (July)



Note: Case dispositions include decisions (allowances or denials) and dismissals.

Source: ALJ disposition data, fiscal years 2005–2014, and fiscal year 2015 through July 31 and Social Security Administration, Office of Disability Adjudication and Review.

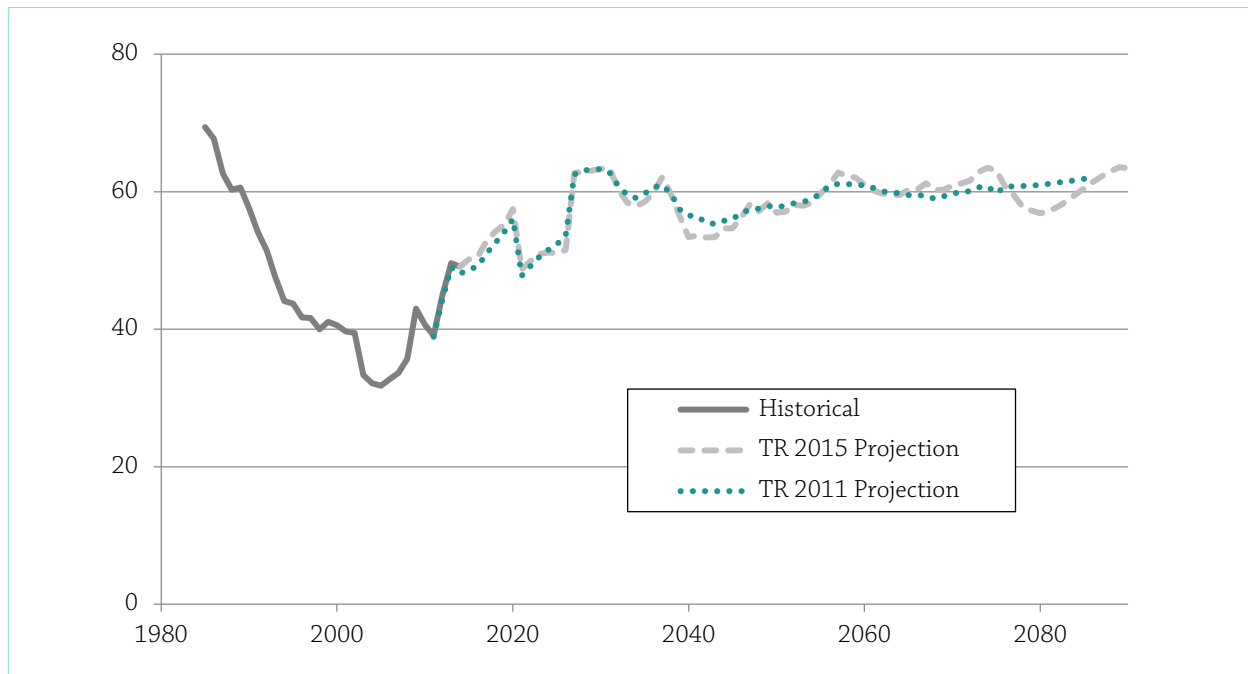
Figure 15B. Percent of Decisions Allowed by ALJ Cohort 2005–2014: Judges Active in 2014, Who Worked at Least 100 Cases in the Year



Note: This chart shows the mean approval rate in FYs 2005–2014, by the year in which the ALJs began their service for those judges who were still active in 2014. The 2005 cohort actually refers to all the judges who were in service as of 2005 (the first year our data begin) who were still working in 2014. The 2009 cohort includes those judges who were hired (or first began deciding cases) in 2009 and remain in service through 2014, and similarly for subsequent years. Approval rates are calculated only for those judges with more than 100 dispositions in a year.

Source: ALJ disposition data, 2005–2014, Social Security Administration, Office of Disability Adjudication and Review.

Figure 16. DI Recipients Converting to Retired Worker Benefits (per 1000 Recipients), Projections of 2011 and 2015 Trustees Reports



Source: Trustees Report 2011, 2015.

The overall evidence leads the Technical Panel to suspect that total allowance rates may have entered a decline beyond that attributable to the business cycle. Hence, the Panel calls for further monitoring and study of the factors that contribute to the recent decline in DI total allowance rates.

### Termination Rates

Individuals may exit the DI program for one of three reasons: 1) conversion to retired worker benefits at full retirement age (FRA); 2) death; or 3) recovery. Of the 769,171 disabled workers exiting from the SSDI program in 2013, 58.9 percent exited due to conversion to retired worker benefits, 32.6 percent due to death, and 7.7 percent because their earnings exceeded the substantial gainful activity level or they no longer met the program's medical eligibility criteria.<sup>53</sup> From 1985 to 2013, the annual exit rate from DI fell from 12.8 percent to 8.6 percent. On average

DI beneficiaries now remain in the program longer than their counterparts of earlier years.

**Conversion to retired worker benefits.** DI recipients who reach the FRA convert to retired worker benefits.<sup>54</sup> Thus, the exit rate associated with the FRA is a function of the DI population's age distribution. As shown in Figure 16, the FRA exit rate trended down during the late 1980s and through the late 1990s as DI enrollment rates increased especially rapidly among younger adults and a decreasing share of DI recipients was just under the FRA. The rate was fairly stable in the early 2000s and artificially low from 2003 through 2008 because of the increase in the FRA that occurred during that period.<sup>55</sup> The FRA exit rate increased between 2011 and 2014, as the oldest members of the Baby Boom generation (born in 1946) reached their FRA in 2012.

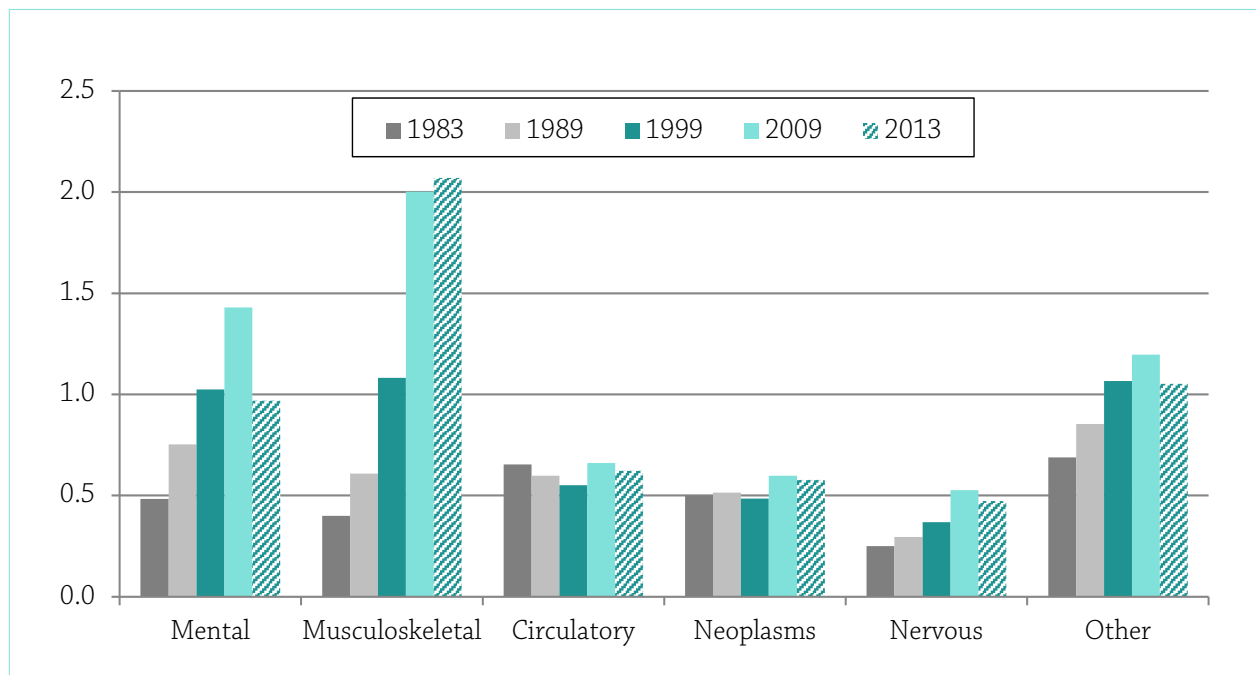
54 The FRA is age 66 for those born from 1943 to 1954.

55 Only DI recipients born from January 1938 through October 1938 would have converted to retired worker benefits in 2003 because the FRA for the group had increased by two months to 65 years and two months. Similarly, only DI recipients born from November 1938 through August 1939 would have converted to retired worker benefits in 2004. In other words, from 2003 through 2008, the size of the cohorts converting to retired worker benefits were about one-sixth smaller because of the policy change, thereby explaining the substantial increase in the exit rate from 2008 to 2009 per Figure 8.

53 All figures in this paragraph are from the Annual Statistical Report on the Social Security Disability Insurance Program, 2013, Tables 49 and 50.



Figure 17. DI Awards by Diagnosis per 1,000 DI-Insured: 1983, 1989, 1999, 2009, 2013



Source: Annual Statistical Report on the Social Security Disability Insurance Program, 2013 (December 2014); Annual Statistical Supplement, 2014 (April 2015).

OACT projects substantial increases in the exit rate in subsequent years, with eventual stabilization at around 60 per 1,000, a rate not seen since the 1980s. The rationale for this predicted rise is the aging of the beneficiary population. The distinct notch in Figure 16 for exit rates predicted for 2021 through 2026 reflects the impact of the rise in FRA from age 66 to age 67 for cohorts born between 1955 and 1960. A one-time rise in the FRA generates a temporary decline and subsequent catch up in FRA exit rates.

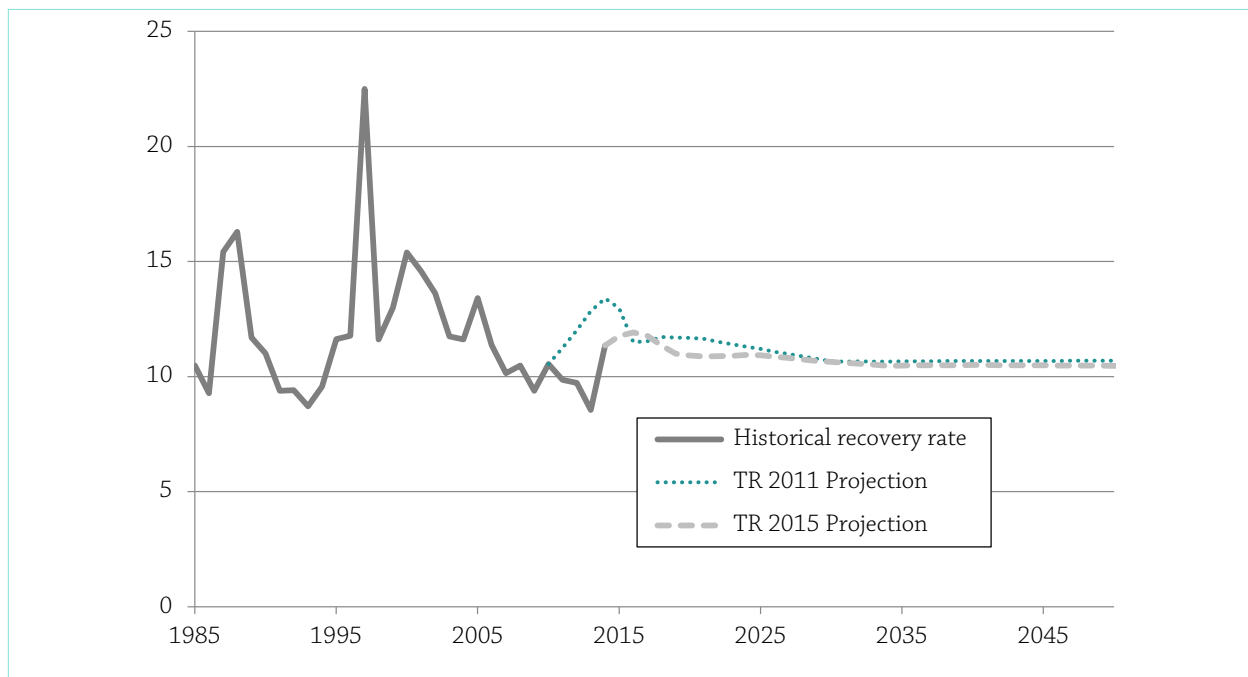
The 2011 Technical Panel was skeptical of the Trustee's assumptions of a gradual rise in the FRA exit rate after 2026. The current Technical Panel does not see a basis for questioning this assumption.

**Mortality.** The mortality rate of DI recipients has declined steadily and rapidly in recent years. The age-sex-adjusted mortality rate fell from 4.70 percent in 1985 to 2.51 percent

by 2015. This decline was substantially greater than for all non-elderly adults during the same period. To some extent, the decline in the mortality rate since 1985 reflects the increase in the share of female DI recipients whose mortality rates are much lower than those of comparably aged males.

An even more important factor, however, is the shift in program-qualifying conditions (see Figure 17). In the early 1980s, the most common conditions among DI recipients were cancer and heart disorders. Following a liberalization of the program's medical eligibility criteria in 1984, applicants could more easily qualify for DI based upon mental and musculo-skeletal conditions, which are difficult to verify but may nevertheless inhibit individuals from functioning in a work-like setting.

Figure 18. Age-Sex-Adjusted Recovery Rate (per 1000 DI Recipients), Projections of 2011 and 2015 Trustees Reports



Source: Data provided by Office of the Chief Actuary, based on *Trustees Reports 2011* and *2015*.

In reviewing these data, the 2011 Technical Panel was concerned that, in projecting mortality rates among DI beneficiaries, the Trustees were not adequately accounting for secular shifts in the composition of disorders towards conditions with low mortality and prolonged morbidity. This concern was amplified by an error in the 2010 *Trustees Report* (since corrected), which projected a ten-year near-hiatus in mortality declines between 2020 and 2030.

Since the 2011 Technical Panel did its work, three developments have placed the 2015 Technical Panel at greater ease with the Trustees' current projections. First, as noted, the Trustees have corrected the prior error that yielded an unrealistically slow decline in mortality rates. Second, the fraction of current DI beneficiaries that qualified with low mortality disorders (mental and musculo-skeletal) appears to have roughly stabilized at 60 percent between 2010 and 2013. Finally, while DI awards per insured population were roughly stable or declining across almost all categories between 2009 and 2013, the largest fall in awards (both proportionately and in level terms) was for mental disorders.<sup>56</sup>

Accounting for the factors above and the adjustments incorporated since the prior Technical Panel's report, the current Technical Panel is comfortable with the Trustees' current mortality assumptions for DI beneficiaries.

<sup>56</sup> The extraordinarily steep fall in awards for mental disorders provides a further piece of evidence that a regime shift in DI determinations is underway.

**Recovery.** The third channel by which DI beneficiaries exit the program is recovery. Beneficiaries are deemed recovered if their reported earnings exceed the substantial gainful activity amount over two-plus years, or if SSA conducts a Continuing Disability Review (CDR) and determines that their condition no longer meets medical eligibility criteria.<sup>57</sup> Returns to the workforce are likely to increase in response to improving economic conditions. The number of CDRs conducted by SSA will largely determine involuntary medical recovery exits.<sup>58</sup>

Figure 18 presents the age-sex-adjusted recovery rate for DI beneficiaries from 1985 through 2014 and the Trustees' long-range projections made in the 2010 and 2015 *Trustees Reports*. The recovery rate was particularly high in 1997, due to a federal policy change that terminated benefits for beneficiaries who qualified for DI due to drug or alcohol addiction. In a typical year, approximately one percent of all DI beneficiaries exit the program because they voluntarily return to work or SSA terminates their benefits due to medical improvement.

<sup>57</sup> The 1984 disability reforms made it substantially harder for SSA to terminate DI benefits due to medical recovery. Prior to 1984, SSA could terminate beneficiaries who were found during a CDR to no longer meet medical eligibility. Following the reforms, SSA could only terminate benefits if the examiner could document that the beneficiary's qualifying impairment had improved since the initial allowance.

<sup>58</sup> We focus on medical CDRs rather than on CDR mailings given that the former are much more likely to result in program exit. The mailings sent to DI recipients ask questions such as, "Has your condition improved?" Perhaps not surprisingly, a very small share leads to benefit termination.

In addition to the state of the labor market, a key determinant of DI recoveries is the number of CDRs performed by SSA. The CDR rate (that is, the fraction of current DI beneficiaries receiving a CDR) rose steeply between 1993 and 2001, and then fell by more than 50 percent, as did the DI recovery rate. While only five to seven percent of CDRs result in benefits termination, CDRs nevertheless account for a substantial share of DI recoveries.<sup>59</sup>

In their 2011 report, the Trustees projected a substantial increase in recoveries between 2011 and 2014. This increase did not occur—in fact, recoveries continued their trend decline in these years (see Figure 18)—until 2014. The 2011 Technical Panel noted that the assumption of a sharp increase sustained over the long term seemed to rest on an optimistic forecast of SSA's ability to process more CDRs, which in turn depended upon ongoing Congressional budget authorizations to support this activity.<sup>60</sup> Seeing little case for optimism, the 2011 Technical Panel recommended an almost 20-percent reduction in the intermediate-case assumption for recoveries, and a significantly larger uncertainty range between the intermediate-cost, low-cost, and high-cost scenarios. Specifically the 2011 TP recommended reducing the estimated recovery rate from 10.9 to 8.7 per 1,000 beneficiaries, with high-cost and low-cost scenario estimates of 6.0 and 11.4 recoveries per 1,000.

The Trustees did not, for the most part, heed this recommendation. The 2014 and 2015 *Trustees Reports* reduced the estimated recovery rate to 10.4 recoveries per 1,000

beneficiaries (approximately 20 percent of the suggested reduction), and reduced the high- and low-cost estimates to 8.3 and 12.6 recoveries per thousand. The Trustees currently project a steep increase in recoveries between 2013 and 2015, a modest decline in recoveries between 2014 and 2032, and a convergence to a long-run recovery rate of 10.4 per 1,000 DI recipients, with low-cost and high-cost estimates of 12.6 and 8.3 respectively.

The data that have accrued since the prior Technical Panel provide qualified support for the Trustees' prior optimism regarding recoveries. The percentage of DI recipients receiving CDRs increased by 60 percent between 2011 and 2014, and is projected to rise substantially further in 2015 (Figure 19). The apparent halt to the secular rise in awards for low-mortality mental and musculo-skeletal disorders (Figure 17) further suggests that the duration of new DI spells may stabilize or decline—though this stabilization is likely to affect the mortality rate more than the recovery rate. In light of these developments, this Technical Panel believes that the Trustees' current assumptions remain too optimistic, but not by as much as the previous Panel.

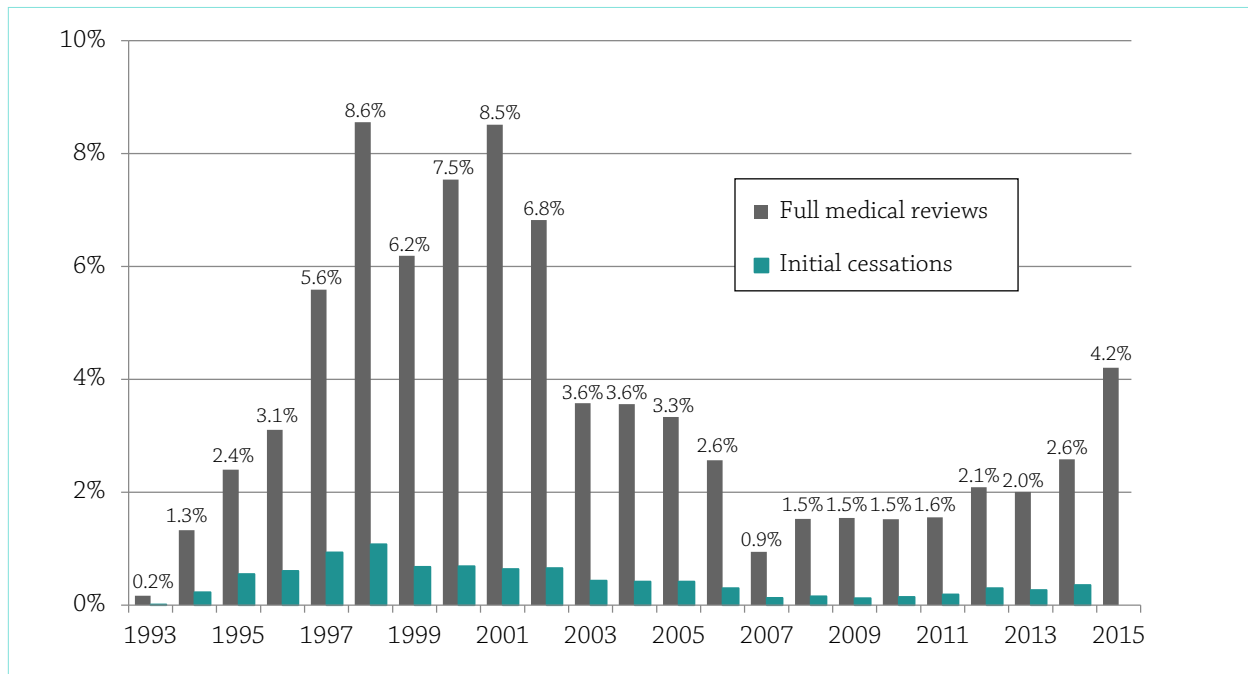
The Technical Panel recommends lowering the intermediate, high-cost, and low-cost assumptions for the DI recovery rate from 10.4 to 10.1 recoveries per 1,000 (a level last seen in 2007). We recommend symmetric downward increments to the low- and high-cost rates: from 12.6 and 8.3 recoveries per 1,000 respectively to 12.3 and 8.0 per 1,000.

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59 In 2001, for example, 6.8 percent of beneficiaries received a CDR and 4.0 percent of those were terminated. These 20,592 terminated beneficiaries accounted for 38 percent of all recoveries in 2007, with the remainder accounted for by beneficiaries who were terminated due to earnings above SGA (Annual Statistical Report on the Social Security Disability Insurance Program, 2007, Table 50).

60 As the prior Technical Panel noted, OCACT estimates that CDR expenditures reduce subsequent program outlays by approximately seven to ten dollars per CDR dollar spent.

Figure 19. Percentage of DI Recipients in Current Payment Status (a) Receiving Full Medical Continuing Disability Reviews and (b) Initially Ceased due to Medical Review, 1993–2015



Source: OCACT, June 2015.

## Conclusion

The secular rise in SSDI prevalence over the past three decades stems from three distinct sources, at least two of which (aging and incidence) reinforced one another. These contributing factors are not likely to recur, meaning that a further rise in SSDI prevalence is not inevitable. Thus, in projecting the evolution of the SSDI program, the Technical Panel recognizes that the years ahead are unlikely to closely resemble the preceding decades. The data that have accumulated since the prior Technical Panel regarding DI prevalence, incidence, allowance rates, and percent insured, all point to substantially slower program growth. In addition, the Trustees have adjusted some prior assumptions in response to the

2011 Technical Panel's recommendations, most notably regarding mortality. Thus, the current Technical Panel is more sanguine about the Trustees' projections for the DI program than was the prior Technical Panel. Other than the issue of program finances, which is outside the scope of the Technical Panel, we remain concerned about three factors: the unprecedented decline in DI-insured rates among men and the simultaneous plateau in insurance rates among women; the steep fall in total DI allowance rates, which may or may not reverse as the U.S. economy completes its recovery from the Great Recession; and the Trustees' somewhat optimistic projections about future DI recovery rates.

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## Chapter 2. Economic Assumptions and Methods

### ■ 2.1 Labor Force Participation Rate

Higher labor force participation, for any given unemployment rate, means that more people are working and paying into the Social Security system. For some people, added years of work will lead to higher benefit payments, but this will not be the case for everyone. Benefits would not rise, for example, for married individuals whose spousal benefits still exceeded that to which they were entitled based on their own account. And benefits would not increase for an older person with a long career of steady work whose Average Indexed Monthly Earnings (AIME) was unaffected by additional earnings. Even for those, claiming on their own account, whose AIME does rise, the formula through which AIME is translated into benefits will result in only modest benefit increases for all but the very low earners. The net effect of increased labor force participation generally is to reduce the shortfall in the actuarial balance. Because any increase in benefits will lag the increase in revenues, this effect is especially noticeable in the near term.

The Technical Panel has four recommendations:

**Method Recommendation 1.** The Technical Panel recommends that in developing the labor force projections, the Trustees should allow for likely future increases in the educational attainment of the population. One way, but not the only way, to do this would be to assume that U.S. educational attainment will converge over time to the higher levels of education observed in a country such as Canada. Higher levels of education are likely to increase labor force participation rates, raising the level of labor force participation in the projections.

**Method Recommendation 2.** The Technical Panel recommends that the Trustees explore possible methods for incorporating labor-demand factors into the projections. Countries that have experienced large changes in the relative size of different age cohorts could inform this exploration.

**Method Recommendation 3.** The Technical Panel recommends that the Trustees use alternative assumptions about educational attainment and, perhaps more ambitiously, labor demand to produce a more meaningful variation in labor force participation projections for incorporation in the low-cost and high-cost scenarios.

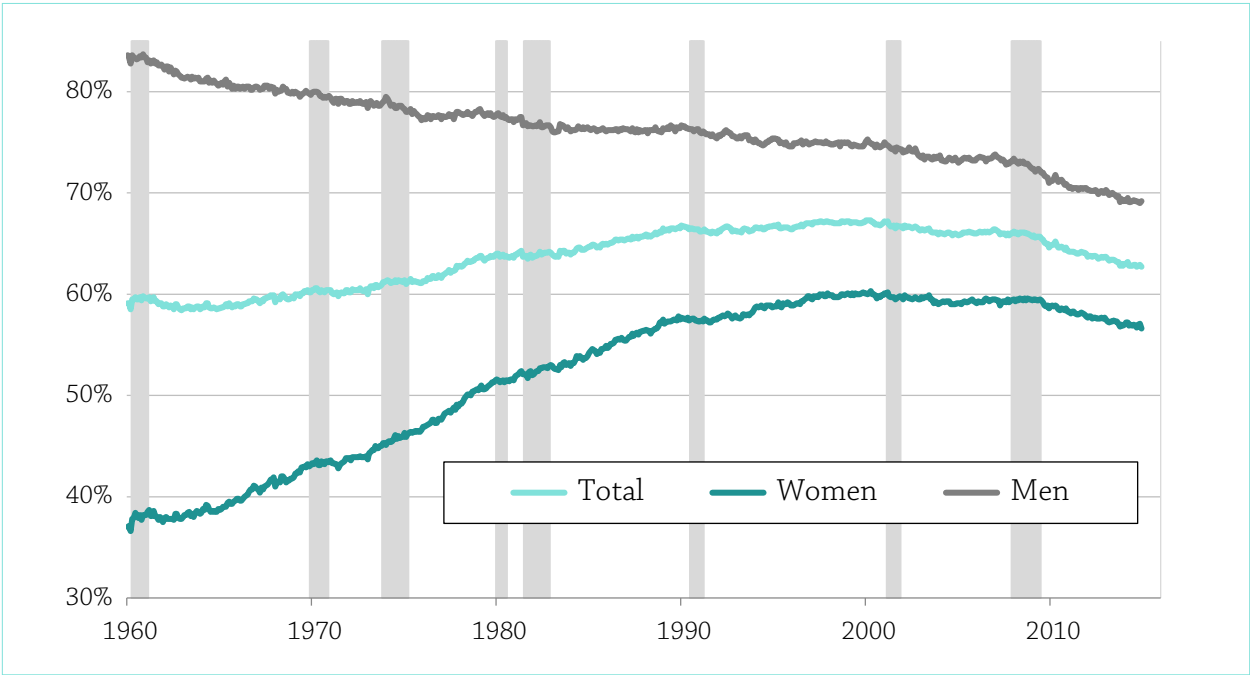
**Presentation Recommendation.** The Technical Panel recommends that information be included in the Trustees' Report that would allow the reader to assess the sensitivity of the projected Trust Fund balances to variations in realized labor force participation rates. One way, but not the only way, to do this would be to consider labor force participation rates that are 10 percent higher or 10 percent lower than those incorporated in the intermediate projection. These variations could be assumed to apply to the entire population or only to individuals in a certain age range.

#### Recent Trends in Labor Force Participation

As can be seen in Figure 20, overall labor force participation rose through about 1990 and has fallen since about 2000. The overall figures, however, hide considerable variation by group.

The decline in labor force participation began long ago for men but also has begun to appear in recent years for women. Among both men and women the pattern differs considerably by age and education. Because much of the recent decline is attributable to changing demographics, it is crucial to look at participation by narrow age groups.

Figure 20. Labor Force Participation Rates, Total, Male and Female, 1960–2014



Source: Bureau of Labor Statistics. (Shaded areas represent recessions)

Broadly speaking, labor force participation starts out low during the teen and young-adult years, rises during the middle years, and then falls again as retirement becomes an option. In the United States, the outsized Baby Boom cohort—the group born from 1946 to 1964—contributed to the overall growth in participation from the mid-1960s through the mid-1980s, as its members flowed into the workforce. Now, however, the Boomers are starting to retire and overall participation naturally has begun to fall. The well-understood effects of population aging on the overall labor force participation rate will continue to play out across the coming decades.

Figures 21A and 21B show how labor force participation rates have changed since the mid-1970s for men and women ages 16–19 and 20–24 (left panel), ages 25–54 and 55–59 (middle panel), and ages 60–64, 65–69 and 70 plus (right panel). A complication in interpreting the participation rates of all these groups is the difficulty sorting out how much of the recent experience is a temporary consequence of the Great Recession and how much reflects longer-term structural influences. Available evidence suggests both have been important.

Figure 21A. Male Labor Force Participation Rates, 1977–2014

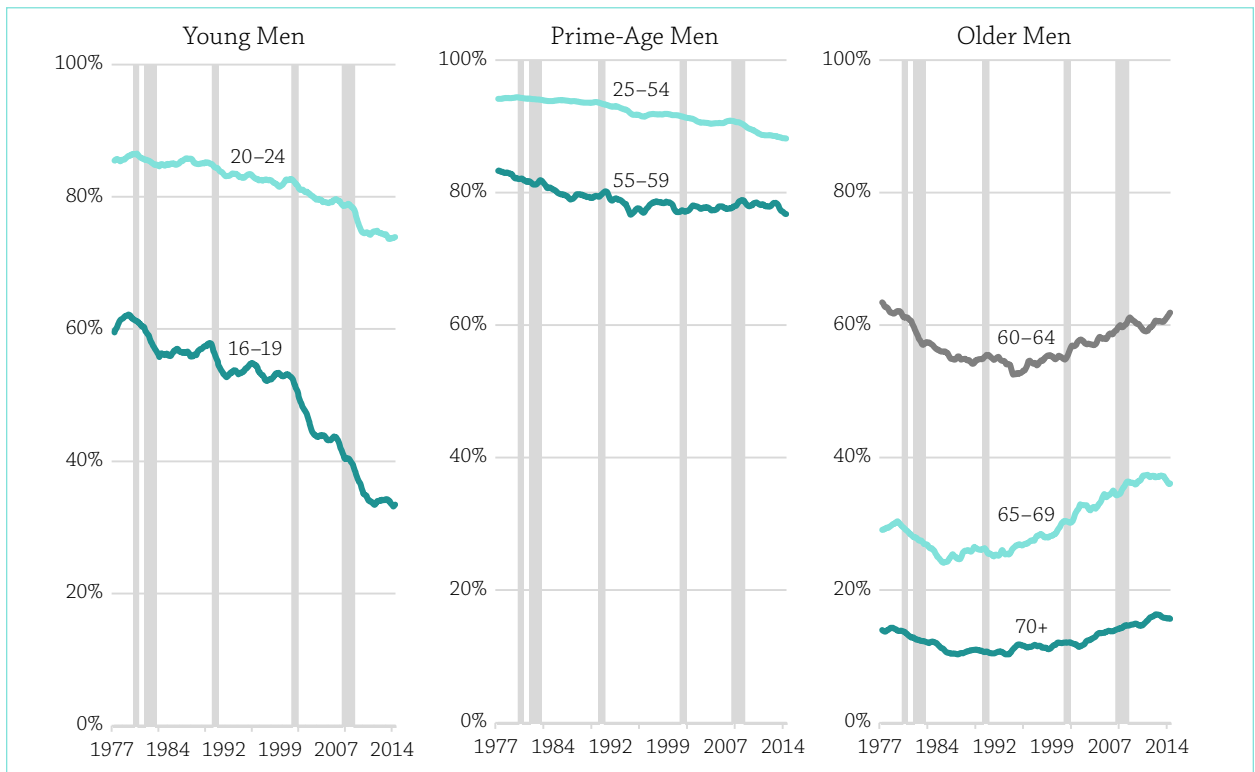
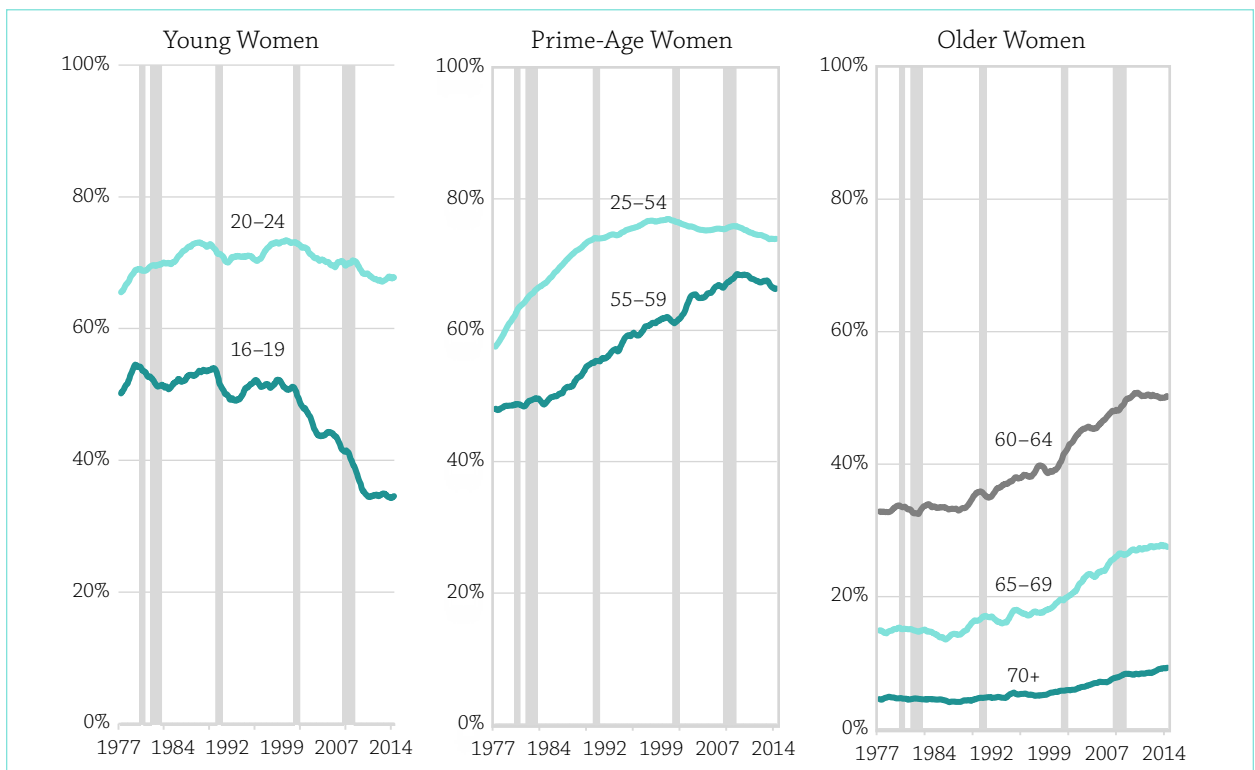


Figure 21B. Female Labor Force Participation Rates, 1977–2014



Source: Bureau of Labor Statistics. (Shaded areas represent recessions)



Participation among both teenagers and young adults aged 20–24 has declined since about 2000. This trend largely reflects the rising share of teens and young adults who are in school and the falling share of those in school who choose to work. To the extent that additional education tends to be associated with higher participation at older ages, the low participation rates among today’s younger cohorts is apt to be a misleading indicator of their likely future participation levels.

Less pronounced slides in labor force participation among men aged 25–54 are also apparent. For women aged 25–54 a leveling off and recent decline in participation has followed decades of increase. Similarly, for women 55–59 the increases of the past have leveled off and a slight decrease may have occurred recently.

Much of the long-term decline in participation among prime-age men reflects a deterioration of job opportunities for less-educated workers, driven by changes in technology and the increasing openness of the economy to foreign competition. For less-skilled men whose job opportunities are limited, disability benefits can offer an attractive alternative to remaining in the labor market—and the same seems increasingly to have been true for less-educated women. However, as explained elsewhere in this Report, increases in age-specific disability prevalence related to changes in the criteria used to determine disability benefit eligibility appear to have played themselves out and are not likely to be an important driver of labor force participation going forward.

Among prime-age women, other factors also may be affecting recent trends in labor force participation. In the early 1990s, after increasing steadily for decades, the share of prime-age women active in the U.S. labor market equaled or exceeded the share in many developed countries including the United Kingdom and Canada. But since the late 1990s, female participation has stagnated and even declined here, while continuing to grow elsewhere.<sup>61</sup> Recent research has identified the absence of family-friendly policies, such as paid parental leave, flexibility in hours of work for working parents, and publicly-supported day care for young children, as an important factor limiting the growth of female participation. Labor force participation among prime-age women in the United States is now well below the levels prevailing in Canada, France, Germany, the Netherlands and Sweden—and only slightly higher than in Japan, where women’s low participation has become a high-profile issue.

In contrast to the recent declines at younger ages, participation has risen substantially for older Americans—both men and women—since the mid-1980s. Reforms to the

Social Security system—including the increase in the normal retirement age, the elimination of the earnings test for those past the normal retirement age, and the increase over time in the generosity of the delayed retirement credit—are one set of factors that seem likely to have affected participation at older ages. For women, however, the increase in participation at older ages began before the Social Security changes took effect, and it is not yet clear to researchers how important those changes have been in explaining the growth in participation among older women.

Changes in the private pension landscape also undoubtedly have contributed to increasing participation at older ages. Fewer of today’s retirees are receiving traditional, annuity-like defined benefit pensions that encourage retirement once the maximum benefit level has been reached, while more have defined contribution plans such as 401(k)s that reward additional years of work. Further, with defined benefit pension plans less common and people concerned about their 401(k) balances, many would-be retirees may feel they have no choice but to continue working.

Much of the change in participation among older women appears to have been due to “cohort” effects—that is, persistent differences related to earlier participation patterns that vary by birth cohort. Trends in education can be an important driver of cohort effects, but other factors that may shape the labor market attachment of particular cohorts include economic conditions at the time the group first entered the labor market, changes in divorce laws and contraceptive advances that enable later and better-timed births.<sup>62</sup>

As shown in Figure 22, participation rates for women 60–64 years of age increased from 37 percent to 49 percent for the cohorts born from 1929 to 1948. The increase in participation at older ages for these cohorts could have been predicted fairly accurately by the experiences of the same birth cohorts when they were younger. But for the cohorts born after about 1948, although participation still increases at younger ages, it decreases somewhat in the middle ages, and it is not yet clear what the changes will be at the older ages.

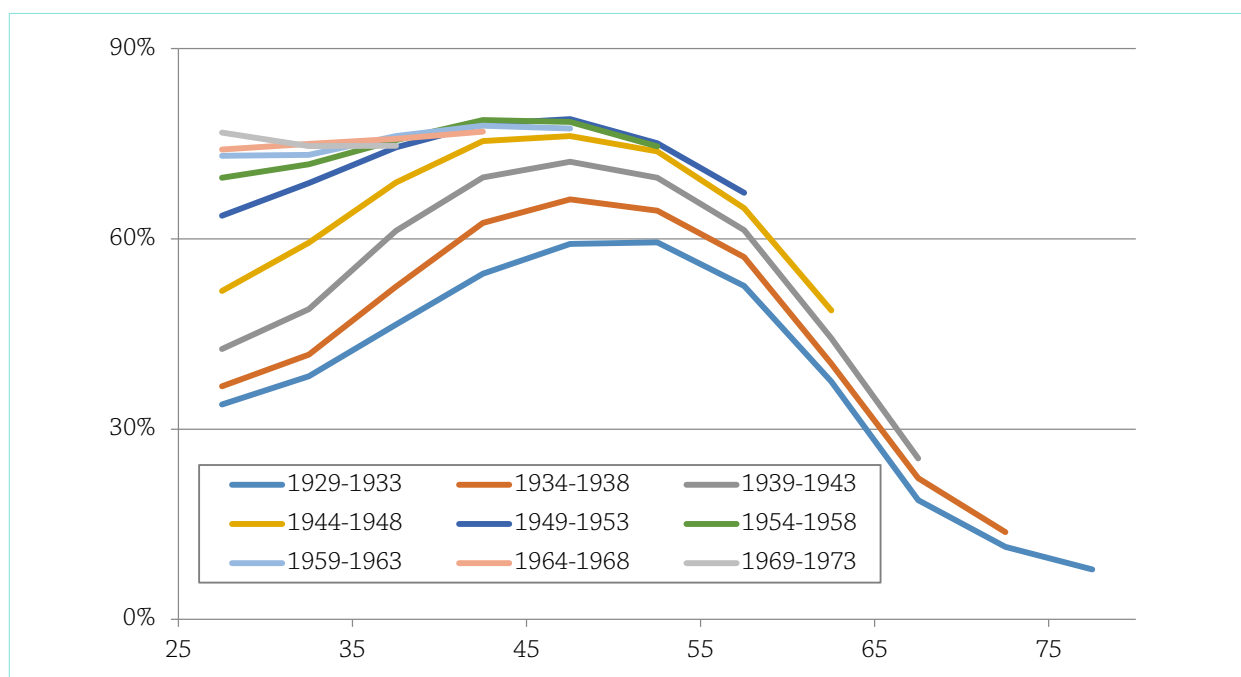
A final factor likely to have affected both male and female participation at older ages is the ongoing increase in life expectancy. In 1980, then-current mortality rates implied that the typical 60-year-old man could expect to live another 17.3 years; by 2010, the average 60-year-old man could expect to live another 21.3 years.<sup>63</sup> Improvements in health at older ages along with shifts in the mix of employment away from physically demanding jobs likely have reinforced the impact of increasing longevity.

61 OECD Employment and Labour Market Statistics on the web.

62 Goldin and Katz (2002).

63 Bell and Miller (2005); OCACT (2010), table on period life expectancy.

Figure 22. Female Labor Force Participation Rate by Five-Year Age Groups and Birth Cohorts



Note: All birth cohort and age group observations are averages of 25 data points (e.g., women born in 1929–1933 observed at ages 25–29).

Source: Bureau of Labor Statistics, Current Population Survey, Annual Social and Economic Supplement.

### The Current Labor Force Participation Model

The model used by the Trustees to develop its labor force projections accounts for many of the factors just described, though some better than others. The model consists of 153 separate equations for groups defined on the basis of age and sex and, in some cases, marital status and the presence of children under the age of six. Depending on the specific group, the factors deemed to affect participation include some combination of current economic conditions as captured by the unemployment rate; the disability prevalence rate; educational attainment; marital status; the number or presence of children; and the Social Security replacement rate. Older men's participation is linked to the participation rates projected for women two years younger, to account for husbands remaining in the labor force longer if their wives are working. Linear cohort effects by birth year are modeled for women born up through 1948, as are lagged cohort effects for those age 75 and older. The parameters that summarize the assumed response in specific groups to changes in these drivers of participation are based loosely on empirical estimates of the historical relationships.

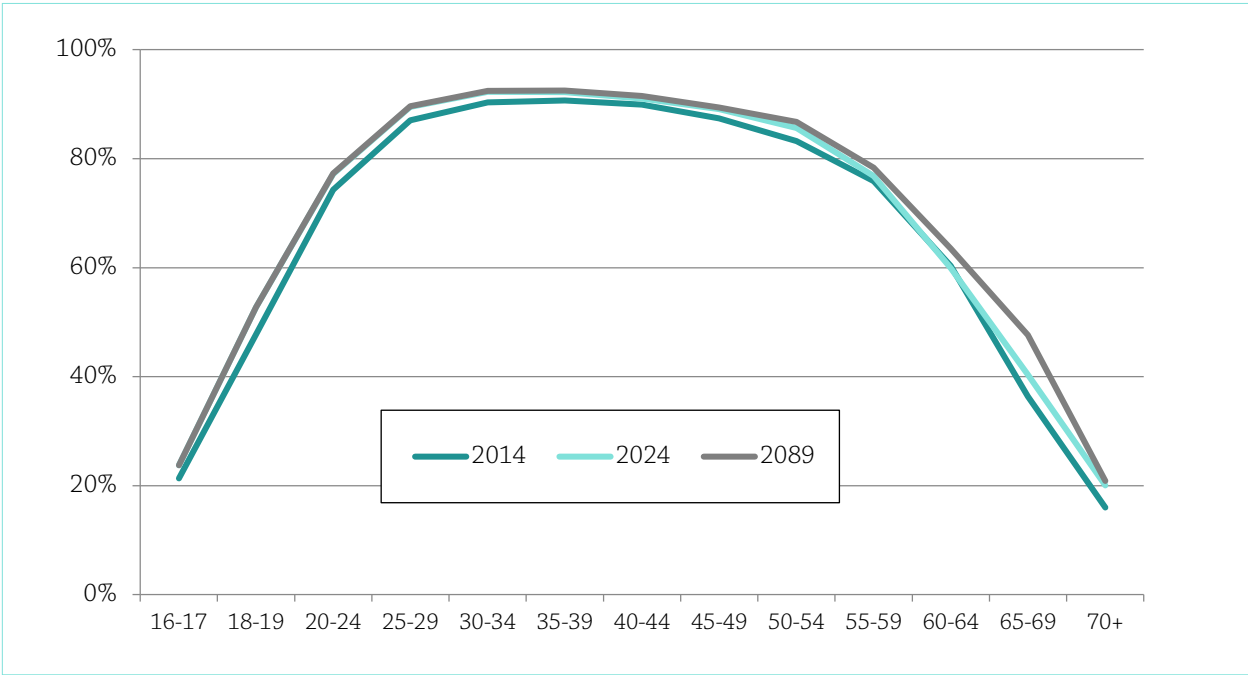
A final component of the age-sex specific models is the so-called life expectancy add factor, calculated as follows. First, age-sex specific labor force participation projections that do not directly account for changes in life expectancy

are prepared. Then, for each sex and target age in each future projection year, the modeler determines the base year age for a person of the same sex for which remaining life expectancy is the same as for the person of the target age in the selected projection year.

The next step is to determine the difference in projected participation between the two age groups prior to accounting for the effects of longevity changes. Because the effects of other factors on age-specific participation rates largely play themselves out within a relatively few years, it does not matter exactly which year is chosen for determining these participation rate differences. The projected differences in 2050 are used in the calculations.

To illustrate, suppose that a man who is 60 years old in 2030 is projected to have 25 more years to live and that a 58 year old in 2015 had the same expected 25 additional years of life. The longevity add factor for 60 year olds in 2030 is set equal to 40 percent of the difference between age 58 (initially projected) participation and age 60 (initially projected) participation in 2050. So, if the 58 year old had a projected participation rate of 69 percent and the 60 year old had a projected participation rate of 64 percent in 2050, the 5-percentage-point difference between these projected participation rates would be multiplied by 0.4, and 2 percentage points added to the 64-percent figure initially projected for the 60 year old in 2030.

Figure 23A. Projected Male Labor Force Participation Rates, by Age, 2014, 2024, and 2089



Source: Social Security Administration, Office of the Chief Actuary, based on 2015 Trustees Report.

The life expectancy adjustment is essentially ad hoc, but it has the plausible underlying rationale that a longer lifetime requires more income to support it. Estimating how longevity affects participation directly may be problematic because longevity has changed smoothly over time, and the limited variation makes it difficult to identify its impact. In addition, past increases in longevity often have been associated with *decreased* participation, likely because income and wealth were increasing at the same time as a result of rising wages and the expansion of Social Security and the private pension system.

Despite its obvious comprehensiveness and complexity, the labor force participation rate model does not incorporate explicitly some potentially important factors, such as changes in the private pension system and shifts in the demand for different types of labor. Further, in practice most of the factors that are considered in the model have little effect on projected age-and-sex-specific participation rates. This finding is largely because the inputs to the model are not projected to change much in future years. As is typical in economic projections, for example, unemployment is assumed to rebound to its natural rate and then remain at that level, so that changes in economic conditions do not affect projected participation rates after the first few years of the projection period.

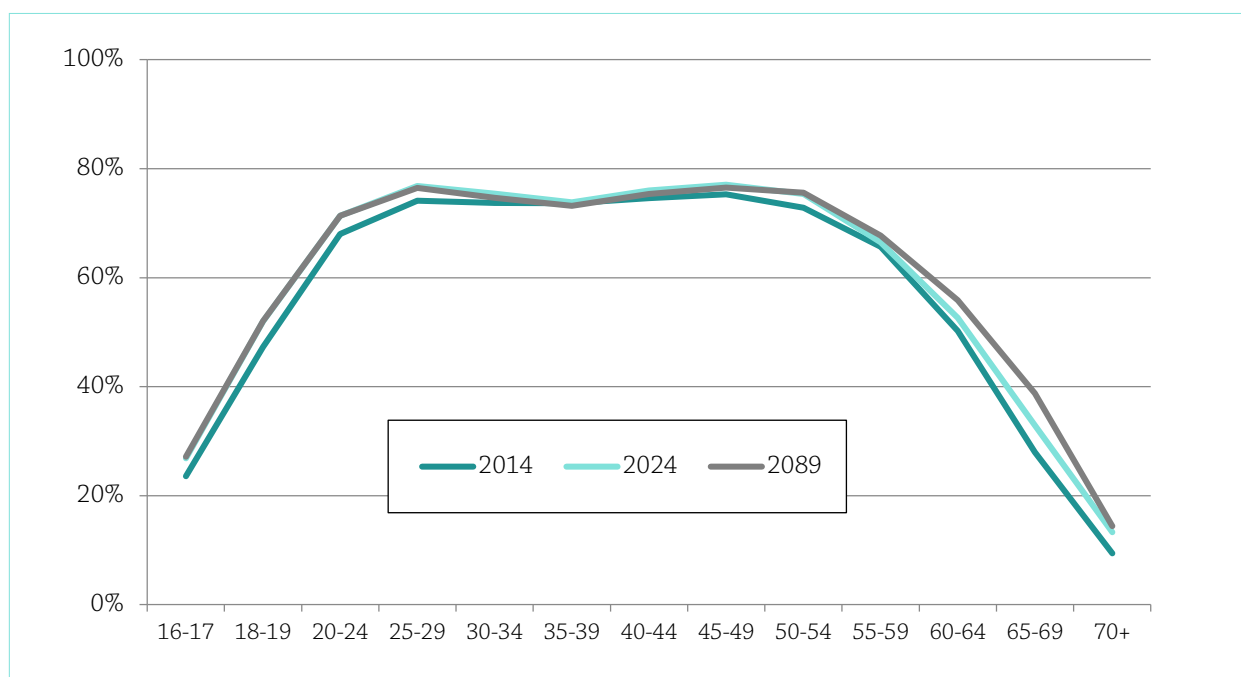
More troubling to the Panel is the assumption that completed educational attainment will be the same for all

future cohorts as observed for those currently age 35. Although the growth of completed educational attainment may have slowed, school enrollment rates have picked up considerably in recent years, especially for women, calling into question the assumption of no future changes in completed educational attainment.

The one exception to the generalization that the factors in the model have little impact on projected future participation is the life expectancy add factor. That adjustment continues to exert an influence on projected participation at older ages since life expectancy is projected to rise throughout the forecast period.

Figure 23A plots the actual 2014 and projected 2024 and 2089 labor force participation rates based on the Trustees' intermediate 2015 projections by age for men; Figure 23B plots the same information for women. Although three lines are plotted, only two are visible across most of the age distribution since, at most ages, the line for 2089 lies directly on top of the line for 2024. Projected participation at younger ages is anticipated to rebound as unemployment returns to more normal levels, but to change little after that time. At older ages, the life expectancy add factor leads to projections of continuing increases in participation over time. Participation rates by age and sex are projected to change little for those of prime working age.

Figure 23B. Projected Female Labor Force Participation Rates, by Age, 2014, 2024, and 2089



Source: Social Security Administration, Office of the Chief Actuary, based on 2015 *Trustees Report*.

### Improving the Performance of the Labor Force Participation Model

Past OCACT projections of labor force participation for older women have been substantially too low. Much of the difference between the actual and the projected numbers appears due to the projections not having adequately captured cohort-specific factors, such as education, that were associated with higher participation earlier in these women's lifetimes.

As an example, consider the participation rates at age 60–64 years for women in the cohort born in the five-year interval 1946–50 shown in Table 6. In 1984, OCACT

projected that these women would have a participation rate of 37.5 percent in 2010. In 1992, the 2010 projection for the same group was even lower (35.0 percent). Yet the actual participation rate for 60–64 year old women in 2010 was 51.0 percent, meaning that OCACT projections made in 1984 and 1992 were too low by 13.5 and 16 percentage points, respectively. Interestingly, the participation rate of a cohort 25 years older than the one under consideration—women in the 1920–24 birth year cohort who were 60–64 years old in 1984—was already known in 1984 to be about the same (34.0 percent) as the level that OCACT projected for the younger cohort.

Table 6. Projected and Actual Labor Force Participation Rates for Women 60–64 Years Old

(a) OCACT projection for 1946–50 birth cohorts made in 1984 for 2010	37.5%
(b) OCACT projection for 1946–50 birth cohorts made in 1992 for 2010	35.0%
(c) Actual data in 1984 for 1920–24 birth cohorts	34.0%
(d) Actual data in 2010 for 1946–50 birth cohorts	51.0%

Source: Goss, Glanz, and An (1985); Yang and Goss (1992); and OCACT, 2015.

Although we were not able to determine exactly what model was used in 1984 and 1992 to make these labor force projections, it seems clear that cohort-specific influences were not adequately considered, in particular the large increases in education between the 1920–24 birth year cohorts and the 1946–50 birth year cohorts. In 1984 most women in the cohort born in 1946–50 had already finished their schooling and their completed education levels therefore could be observed. Data available at the time would have shown that they were considerably more educated than those in preceding cohorts, and cross-section estimates would have suggested that more educated women could be expected to have longer working lives.

Examination of these older projections offers several lessons for the current model. First, cohort effects historically have been very important. The model(s) used to produce the 1984 and 1992 projections may not have included cohort effects; the current model does include them, but assumes that the cohort effect will be the same for any cohorts born in 1949 or later as for the 1948 birth year cohort. The current model also incorporates effects attributable to cohort differences in education, but these effects seem too small (an example is the predictions for women aged 60–64 for the period from 2023 to 2088). Second, because completed educational attainment for a cohort is largely known by the time the cohort reaches around age 30—three decades before the cohort enters its 60s—projections using such data can be formulated on a sound basis.

As already noted, labor force participation rates for women in their 40s have decreased somewhat over time. The cohort graph referenced earlier (Figure 22) shows that for younger women born after 1944–48, five-year cohort participation rates are actually somewhat lower around age 40 than for the older 1944–48 cohort. But the line for each of the younger cohorts is higher at age 30 and only later do these lines “twist.” It is still unclear to researchers exactly why this is the case; some evidence suggests that it may be related to the delay of child-bearing. The important point is that participation among the younger cohorts may rebound, raising participation for these women in their older years.

One hint that the cohort effects for women in their later ages will continue to rise is that younger cohorts have far greater educational attainment than the older cohorts just mentioned. More specifically, a far greater fraction of the younger women have graduated from college. Data on the educational attainment of native-born men and women

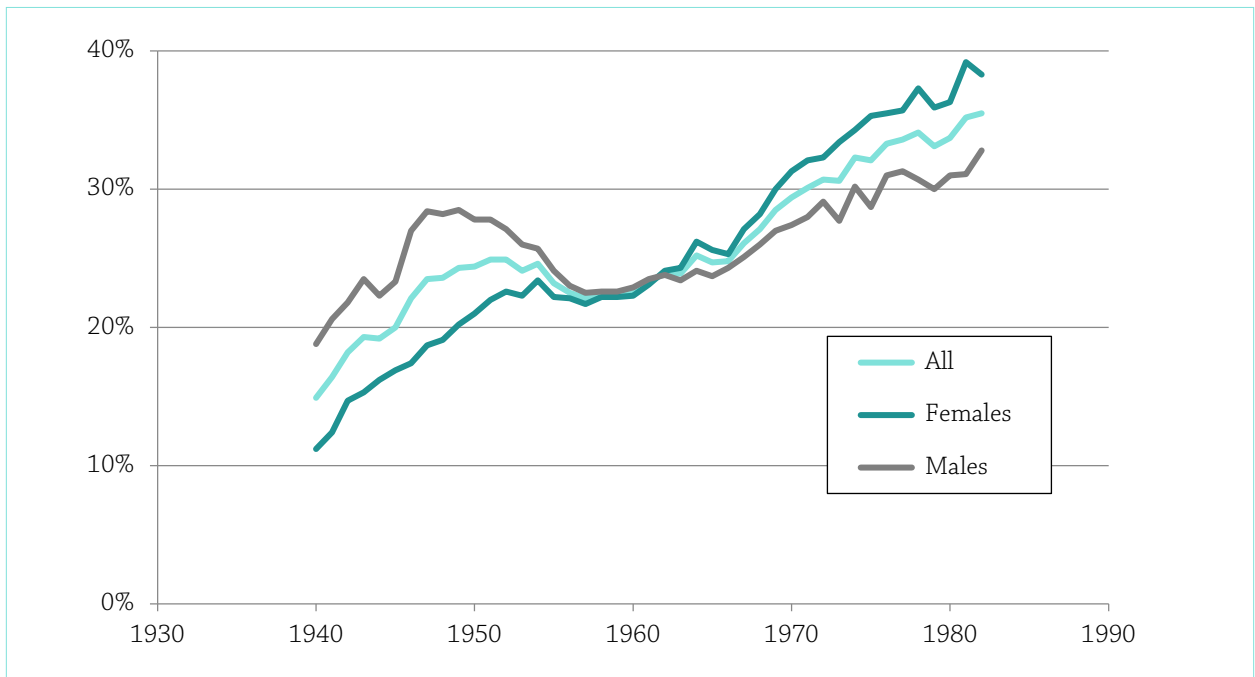
by birth year as of age 30 are shown in Figures 24A and 24B. Among (native-born) U.S. women born in 1948, 19.1 percent had graduated from college by age 30. For those born in 1958, 22.2 percent were college graduates by age 30; among those born in 1968, the figure was 28.2 percent; and among those born in 1978, 37.3 percent. College attendance and graduation rates for women have been increasing for quite some time.

The situation for men is somewhat more complicated. Indicators of male educational attainment stagnated between the birth cohorts of 1948 and 1966, but cohorts born in the 1940s had greatly increased college attendance and graduation because, for some period, college enrollment allowed men to qualify for Vietnam draft deferments. As can be seen in Figure 24B, years of education among males seem to have been drifting upwards for all cohorts since the 1966 birth cohort, albeit at a slower and less consistent pace than among women.

All of this leads the Panel to recommend reconsideration of the assumption that educational attainment among cohorts currently under age 35, including those that have not yet been born, will look exactly like educational attainment among today’s 35 year olds. The substantial earnings premium associated with higher education and the current focus on raising college graduation rates by U.S. policy officials across the political spectrum suggests the share of people with higher education credentials will continue to expand. The relationship between education and participation observed in the cross section may suggest a stronger effect than overall increases in the level of education will have on participation over time. Still, to the extent that demand for educated workers continues to be strong and more-educated individuals continue to find jobs that are well paid, reasonably stimulating, and not especially physically demanding, we should expect growth in educational attainment to be associated with higher labor force participation.

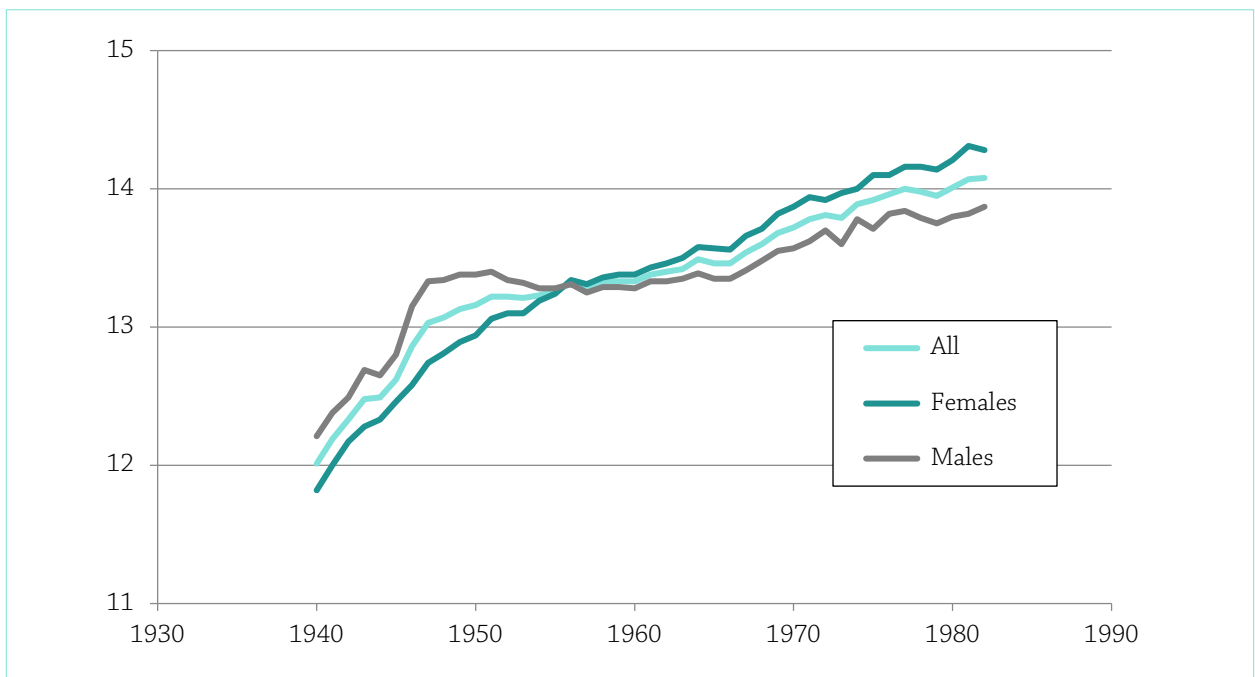
The discussion about education leads to a related point regarding the labor force participation projections, namely that, as presently structured, the projection methodology omits observable factors that likely have had an important influence on labor force participation rates. One such factor is change in the structure of the private pension system. Fewer of those retiring in the future will have a defined benefit pension, and this could encourage them to work longer. This effect may be part of what implicitly is captured in the longevity “add factor” already discussed.

Figure 24A. Percentage of College Graduates by Sex and Year of Birth (U.S. Born) at Age 30



Source: March, Current Population Survey, micro data.

Figure 24B. Mean Years of Education by Sex and Year of Birth (U.S. Born) at Age 30



Source: March, Current Population Survey, micro data.



Table 7. Labor Force Participation Rate Projections for 2089, by Trustees’ Scenarios

Sex	Projected age-adjusted participation rate		
	Low-cost scenario	Intermediate-cost scenario	High-cost scenario
Men 16 plus	73.5%	73.4%	73.3%
Women 16 plus	61.6%	61.0%	60.0%

Source: 2015 *Trustees Report*, Section V.B.5.

The current projections also give short shrift to the role of labor demand, focusing almost exclusively on the role of factors expected to affect the labor supply curve. Ample evidence suggests that labor demand can have an important influence on the labor force participation rate. Generically, any outward shift in the demand for labor relative to the supply of labor can be expected to produce both higher wages and higher participation; inward shifts in the demand for labor can be expected to have the opposite effect. In the recent past, technology and globalization are widely understood to have produced adverse shifts in the demand for low-skilled prime-age workers, lowering their potential wages and thus their labor force participation rates.

It is difficult to predict how labor demand is likely to evolve in the future. On the one hand, some have argued that accelerating changes in technology and continued globalization will translate into lower wages, fewer jobs and lower participation rates in the future. On the other hand, it is not entirely clear that these trends will continue. Furthermore, they could be offset by demographic changes over the coming decades that will reduce the share of the population in the prime working years and by educational and training upgrading.

To the extent that these demographic changes mean that, all else the same, fewer workers will be available relative to the size of the population, they could lead employers to work harder to retain older workers or to be more accommodating of prime-age women who would like to work but also have family responsibilities, raising labor force participation among both groups. These are by no means necessary outcomes—employers facing a labor shortfall also have a variety of other options potentially available to them, such as increasing the capital intensity of their workplaces or increasing their reliance on immigrant workers—but they are at least plausible outcomes. The Panel recommends that the Trustees explore ways in which demand factors might be incorporated more directly into the projections model.

### Recognizing the Uncertainty about Future Labor Force Participation

Although the *Trustees Report* is focused on the intermediate-cost projections, the low-cost and high-cost scenarios are also important. In contrast to some other variables, the values for labor force participation associated with the low-cost and high-cost scenarios are derived rather than assumed directly. The starting points for these labor force values are the low-cost and high-cost assumptions for other parts of the model that determine the values of variables that are inputs to the labor force participation model—unemployment, mortality, marital status, fertility, disability prevalence and the replacement rate. Values for these explanatory variables are entered into the labor force model and the resulting age-adjusted labor force participation rates then calculated. As can be seen in Table 7, the participation rates projected for 2089 adjusted to match the 2011 population age distribution are very close across the three scenarios:

This close similarity is partly because the full set of changes in other variables associated with moving from, say, the intermediate-cost scenario to the high-cost scenario have offsetting effects on labor force participation. For example, both life expectancy and disability prevalence are higher in the high-cost scenario, but their effects on labor force participation go in opposite directions.

Rather than being derived purely from assumptions about other variables that themselves might be expected to raise costs or lower costs, uncertainty about the future path of labor force participation could be incorporated more directly into the projection methodology. To illustrate, if the doom-and-gloom technologists are right, the future demand for labor and thus future age-adjusted participation rates could be far lower than implied by the intermediate-cost base case. On the other hand, rising educational attainment could produce notably higher labor force participation rates.



The Panel's final recommendation with regard to the labor force component of the projections relates to the sensitivity of the trust fund balance to alternative participation rate outcomes. This is not something that OCACT addresses routinely, but testimony given by Chief Actuary Stephen Goss in July of 2010 before the Senate Finance Committee described what would happen to the trust fund if older workers were to delay their retirements. One of the scenarios he considered was an increase in labor force participation rates at age 45 and above to the rates that prevailed for men in 1950. According to his estimates, this change would have reduced the actuarial deficit over the 75 years then being projected from 2.00 percent of taxable payroll to 1.02 percent of taxable payroll, a decline of 0.98 percent of taxable payroll; the decline in the annual deficit projected for the 75<sup>th</sup> year of the projection would have been smaller, but still sizable at 0.54 percentage of taxable payroll. While this particular change is larger than seems plausible, these estimates nonetheless highlight the potential sensitivity of the sustainability of the trust funds to higher or lower labor force participation.

## ■ 2.2 Unemployment Rate

In the Trustees' projections, lower unemployment is associated with a net improvement in Social Security's finances, as the increased number of workers raises system revenues by more than it raises future benefits.

**Assumption Recommendation.** The Technical Panel recommends no change in the ultimate, long-run, age-sex-adjusted unemployment rate of 5.5 percent assumed in the 2015 *Trustees Report* for the intermediate cost scenario. The Panel also recommends retaining the assumed values of 4.5 percent and 6.5 percent in the low-cost and the high-cost scenarios.

## Rationale for Unemployment Rate Assumption

Unemployment and labor force participation are related to the employment rate as follows:

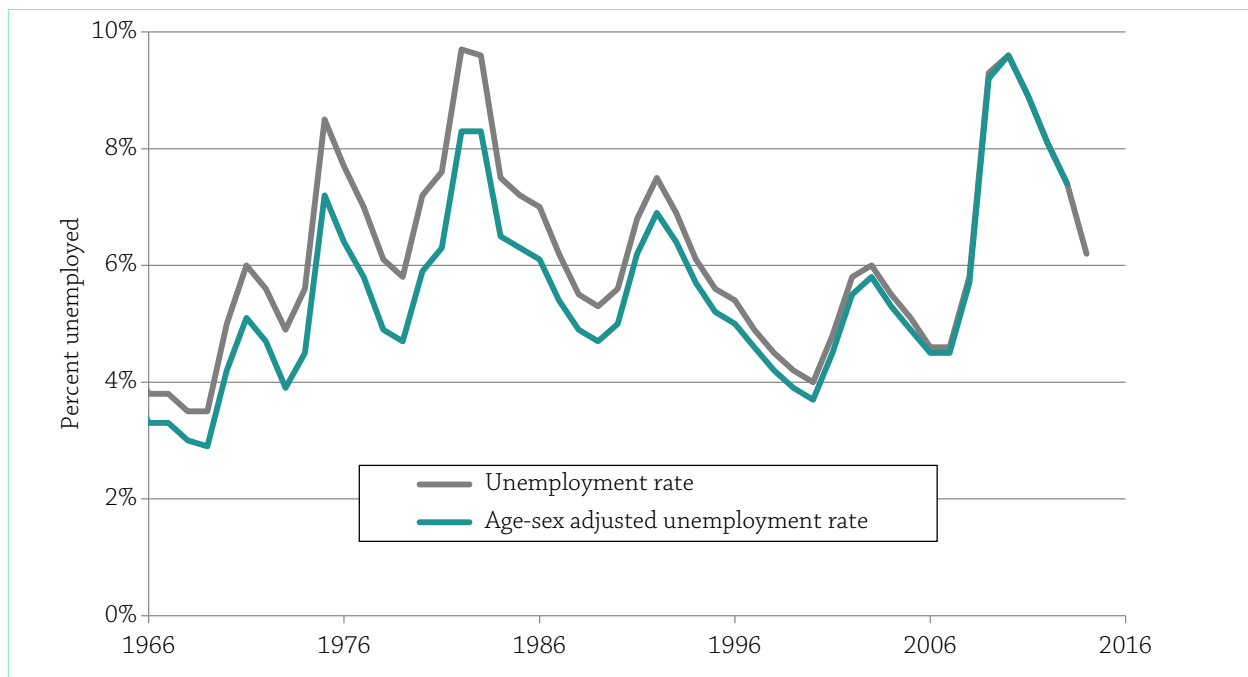
$$EMP/POP = LFPR * (1 - UR)$$

where EMP is employment, POP is population, LFPR is the labor force participation rate, and UR is the unemployment rate. Though not a point the Panel has pursued, this identity does suggest that, in the development of the projections, labor force and unemployment could be considered jointly rather than separately.

Figure 25 plots the unemployment rate for the period from 1966 through the present. Both unadjusted and age-sex-adjusted unemployment rates are shown, with the age-sex distribution that prevailed in 2011 used to construct the latter. The age-sex-adjusted rate is the target of the Trustees' assumptions. Because of the systematic differences in unemployment, especially by age, the Panel is comfortable with focusing on the adjusted rather than the unadjusted unemployment rate in making the projections.

Over the whole period from 1966–2013, the age-sex-adjusted unemployment rate averaged 5.57 percent, slightly above the assumed long-run ultimate value of 5.5 percent. The age-sex-adjusted rate was substantially lower over the first completed business cycle for which data are shown (averaging 3.8 percent from 1966–1972) and has been substantially higher since 2007 (averaging 7.6 percent from 2007–2013). OCACT believes that the demographic shifts associated with the aging of the Baby Boom are likely to change the balance between labor demand and labor supply in coming decades, putting downward pressure on the unemployment rate so that it averages slightly below the average of the rates since 1966. The Panel finds this expectation plausible and sees no reason to recommend a change in the Trustees' assumed ultimate unemployment rate of 5.5 percent. Similarly, the Panel sees no compelling reason to recommend a change in the unemployment rate assumptions of 4.5 percent for the low-cost scenario and 6.5 percent for the high-cost scenario.

Figure 25. Unadjusted and Age-Sex-Adjusted Annual Unemployment Rates, 1966–2013



Source: The Long-Range Economic Assumptions for the 2015 Trustees Report, Table 4.3, July 22, 2015.

## 2.3 Real Earnings Growth Rate

The rate of real earnings growth is a crucial component of the Trustees’ projections. Under current law, initial benefits for each successive wave of retirees are determined by taking the highest 35 years of earnings indexed to the growth in average annual earnings up to age 60 and nominal earnings thereafter.<sup>64</sup> Once the benefit is determined at 62, it is indexed to inflation based on the CPI-W. An increase in real earnings will raise both taxable payroll and the benefits of each cohort of new retirees, but the benefits of existing retirees will be unaffected. In effect, the growth in total benefits will lag behind the rise in revenues. Thus, faster growth in real earnings will lead to a significant increase in the actuarial balance and slower growth to a significant reduction.

**Assumption Recommendation.** The Technical Panel recommends retaining the Trustees’ 2015 ultimate assumption for average annual real earnings growth of 1.17 percent. The Technical Panel also recommends retaining the low- and high-cost assumed growth rates of, respectively, 1.80 and 0.55 percent. Similarly, the Technical Panel recommends no changes to the assumptions for the underlying components

that determine real earnings growth (see Assumption Recommendations (a)–(d)).

### Overview of Real Earnings Calculation

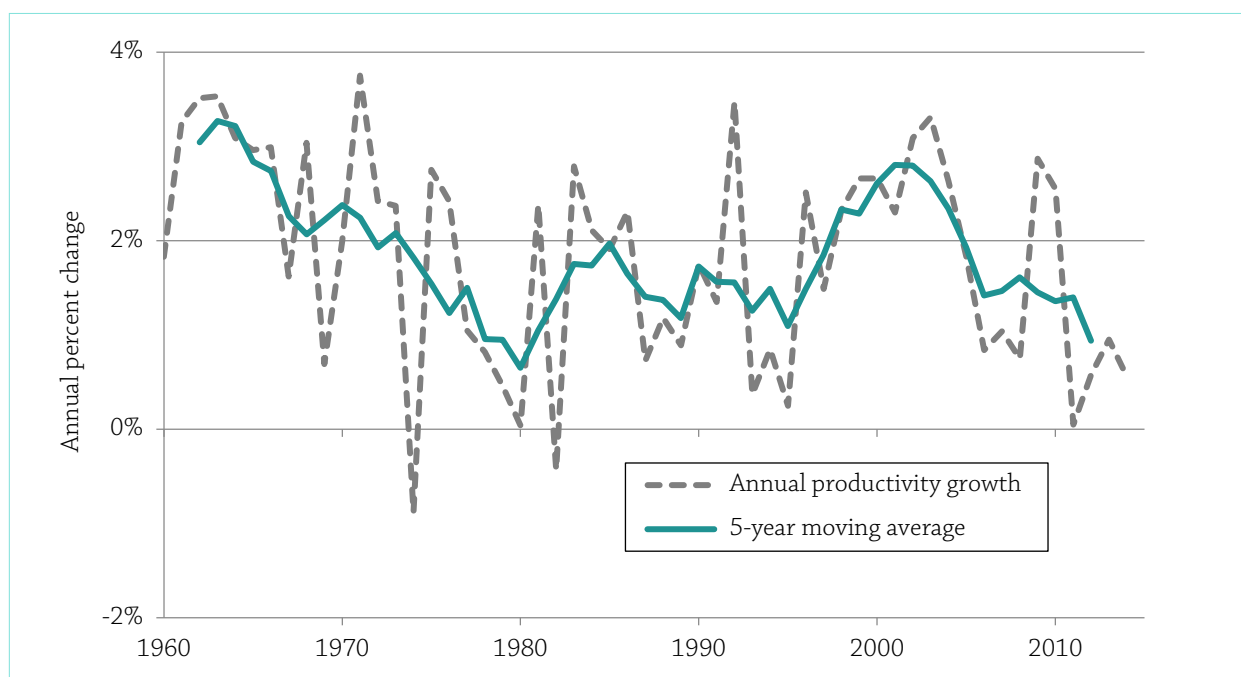
The central driver of growth in real earnings is what happens to labor productivity. The *level* of average real earnings is linked to labor productivity (the first term to the right of the equal sign in the equation below) through four mediating factors (the remaining terms to the right of the equal sign in the equation): 1) labor compensation as a share of total GDP; 2) earnings as a share of labor compensation; 3) average hours per worker; and 4) the ratio of the GDP price deflator to the CPI:

$$\frac{\text{Earnings/CPI}}{\text{Employment}} = \frac{\text{GDP/PGDP}}{\text{Hours}} \times \frac{\text{Compensation}}{\text{GDP}} \times \frac{\text{Earnings}}{\text{Compensation}} \times \frac{\text{Hours}}{\text{Employment}} \times \frac{\text{PGDP}}{\text{CPI}}$$

Using the relationship in this equation, the Trustees then determine the average annual change for each indicator, which allows them to compute real earnings growth. More precisely, as the calculation of the *level* of real earnings involves multiplying the *level* of productivity by the *level* of each link, the *growth* of real earnings is the product of the *growth* in each component, where growth is expressed as a ratio.

<sup>64</sup> Both Social Security’s income and benefits are linked to total covered earnings, which include both wages and net earnings from self-employment.

Figure 26. Annual Productivity Growth and Five-Year Moving Average (Centered), 1960–2014



Source: 2015 Trustees Report, Table V.B1.

For example, if productivity grew by 5 percent from one year to the next, the productivity term in the equation for the change in that year would be 1.05. As an approximation, the *growth* of real earnings can be thought of as the sum of the growth rates of the five terms on the right-hand side of the equation.

The Panel examined both the productivity growth assumption and the assumptions for each of the four mediating factors that link productivity to real earnings.

## Productivity

The growth in total-economy productivity is the largest component of the growth in real earnings. Figure 26 presents productivity growth rates since 1960, with the dashed line showing annual values and the solid line showing a five-year moving average of annual values.<sup>65</sup> Historically, shifts of workers from major sectors with relatively low productivity to major sectors with relatively high productivity, especially the shift out of agriculture into other sectors, have

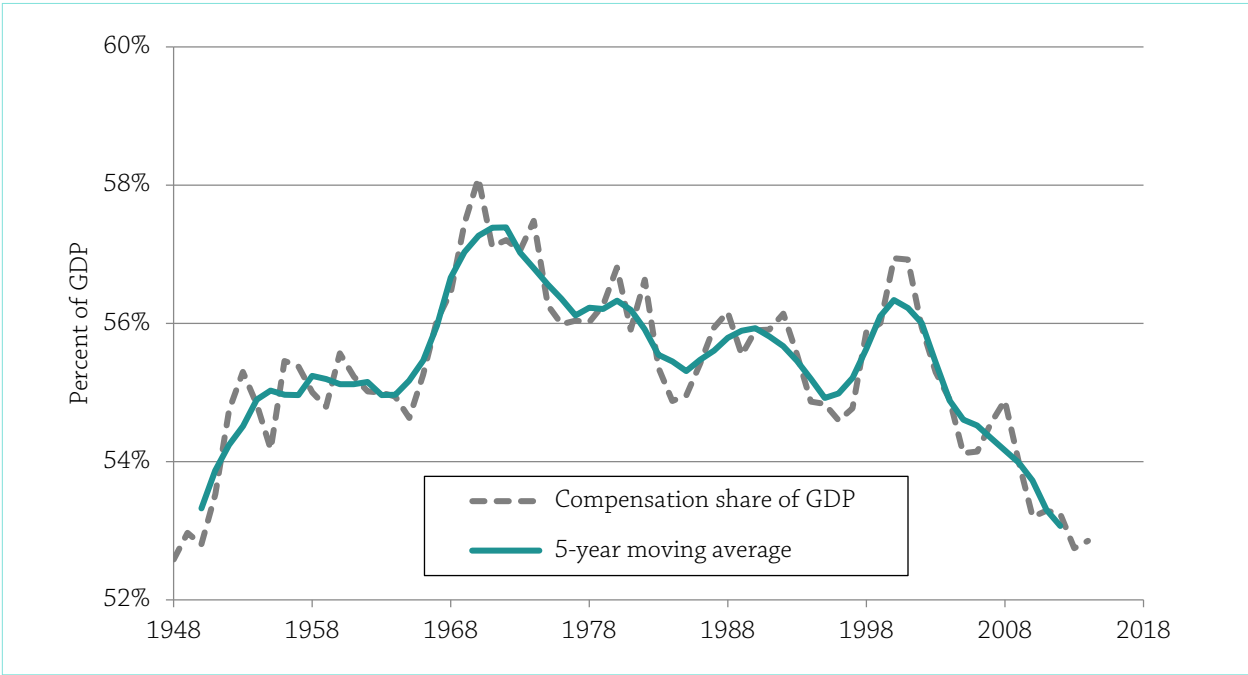
contributed to overall productivity growth. This process largely has played itself out and is not expected to be an important source of productivity growth in the future. In its projections for future productivity growth, OCACT sets a long-range value for each major sector and then calculates the total as a weighted average across the sectors (farm, non-farm business, and household), treating the share of employment in each sector as fixed. The ultimate growth rates in productivity for the non-profit and government sectors are assumed to be zero.

While the annual rate of productivity growth has fluctuated considerably, the intermediate assumption of 1.7 percent per year for productivity growth is close to the annual average growth in productivity over the last 40 years.

**Assumption Recommendation (a).** Like the 2003, 2007, and 2011 Panels, this Panel recommends a productivity growth rate assumption of 1.7 percent per year, consistent with the level assumed in the Trustees' Report since 2006. The Panel also recommends retaining the low- and high-cost assumed growth rates of 2.0 and 1.4 percent, respectively.

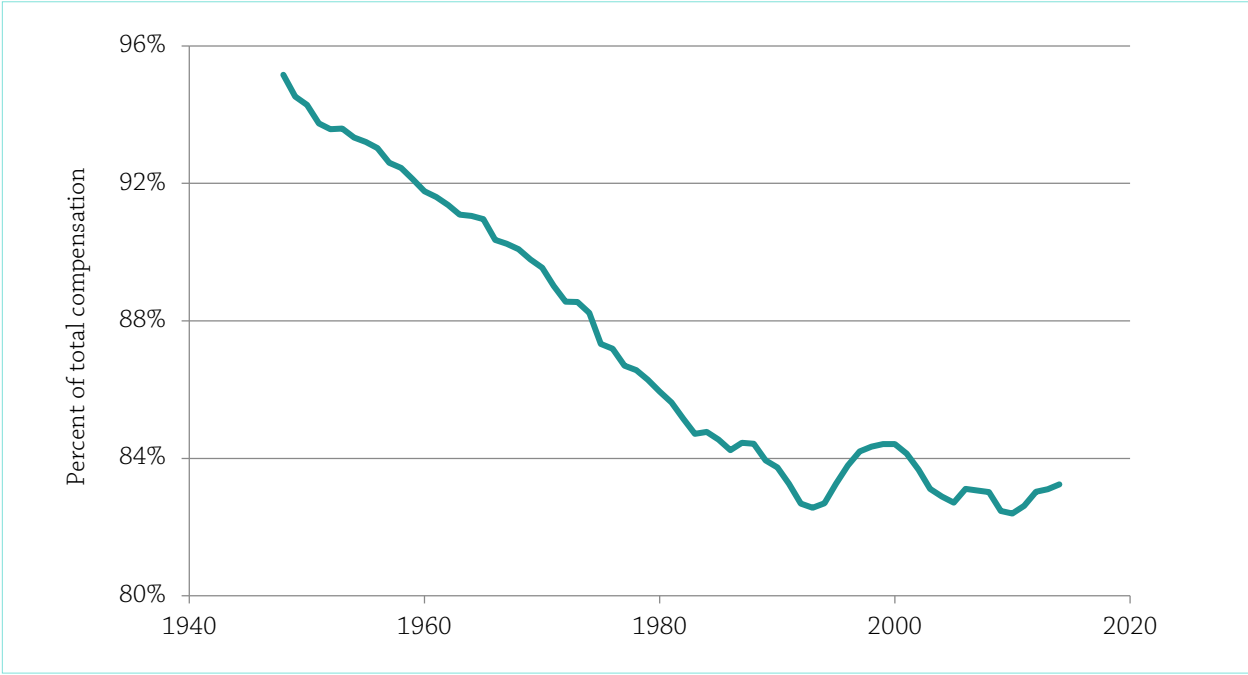
<sup>65</sup> The concept of productivity used by the Trustees pertains to the entire economy, whereas the measure of productivity most commonly discussed in the academic and business communities pertains only to the non-farm business sector. The latter excludes the agricultural sector, along with governments, households, and non-profits. The non-farm business sector is the largest sector of the economy, and its measured productivity growth is typically a few tenths of a percentage point higher than productivity growth in the economy as a whole.

Figure 27. Compensation Share of Gross Domestic Product, Annual and Five-Year Moving Average (Centered), 1948–2014



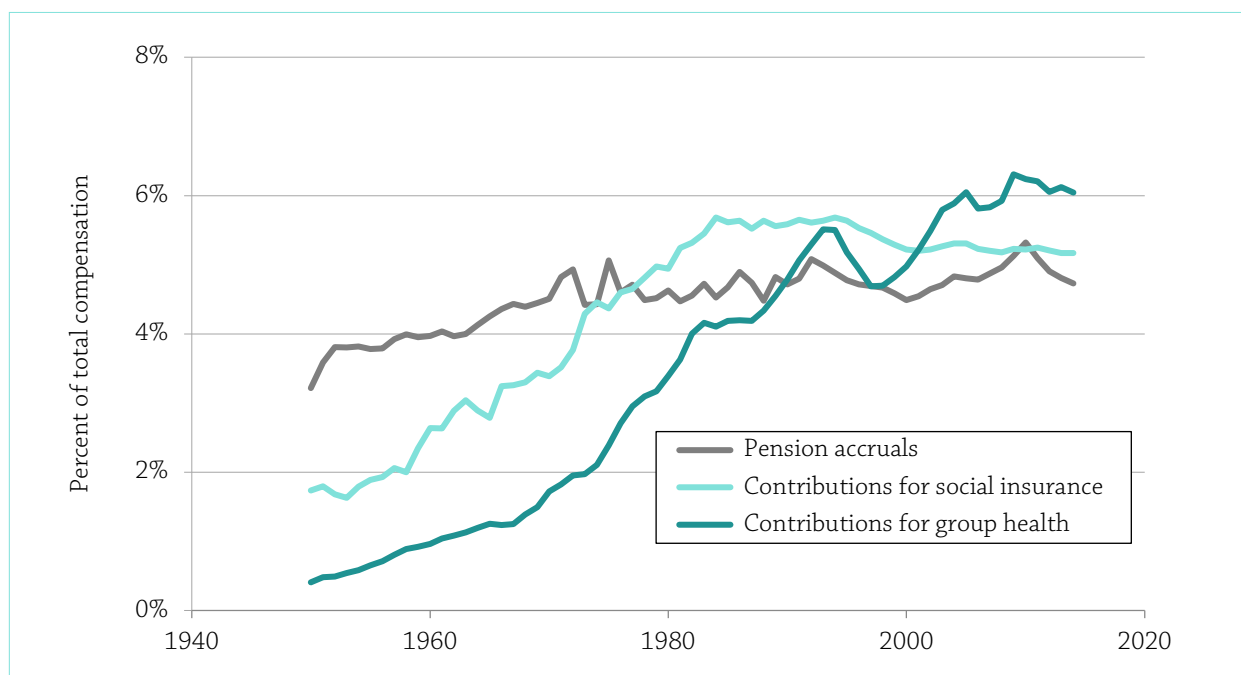
Source: National Income and Product Accounts, Tables 1.1.5 and 2.1, January 30, 2015.

Figure 28. Earnings as a Percent of Total Compensation, 1948–2014



Source: National Income and Product Accounts, Table 2.1, February 27, 2015.

Figure 29. Employer Contributions for Earnings Supplements as a Percent of Total Compensation, 1950–2014



Source: National Income and Product Accounts, Tables 2.1 (February 27, 2015) and 7.8 (August 6, 2015).

### Compensation Share of GDP

Total labor compensation (total labor earnings plus employee benefits and wage-related employer taxes) can be viewed as “labor’s share” of GDP. Figure 27 shows that the compensation share of GDP has declined in recent years. It is conceivable that the overall downward trend will continue, but it is also possible that the compensation share will stabilize at or close to recent values. The Trustees expect that the labor and capital shares will be approximately constant in the future, and therefore set the ultimate annual rate of change in the compensation ratio to zero. This assumed growth rate is broadly consistent with the -0.09 percent experienced over the five economic cycles that preceded the Great Recession (the 41-year period from 1967 through 2007). The Panel has no convincing reasons to propose an alternative assumption.

**Assumption Recommendation (b).** The Technical Panel recommends retaining the Trustees’ assumption of no change in the ratio of compensation to GDP under the intermediate as well as the low and high cost scenarios.

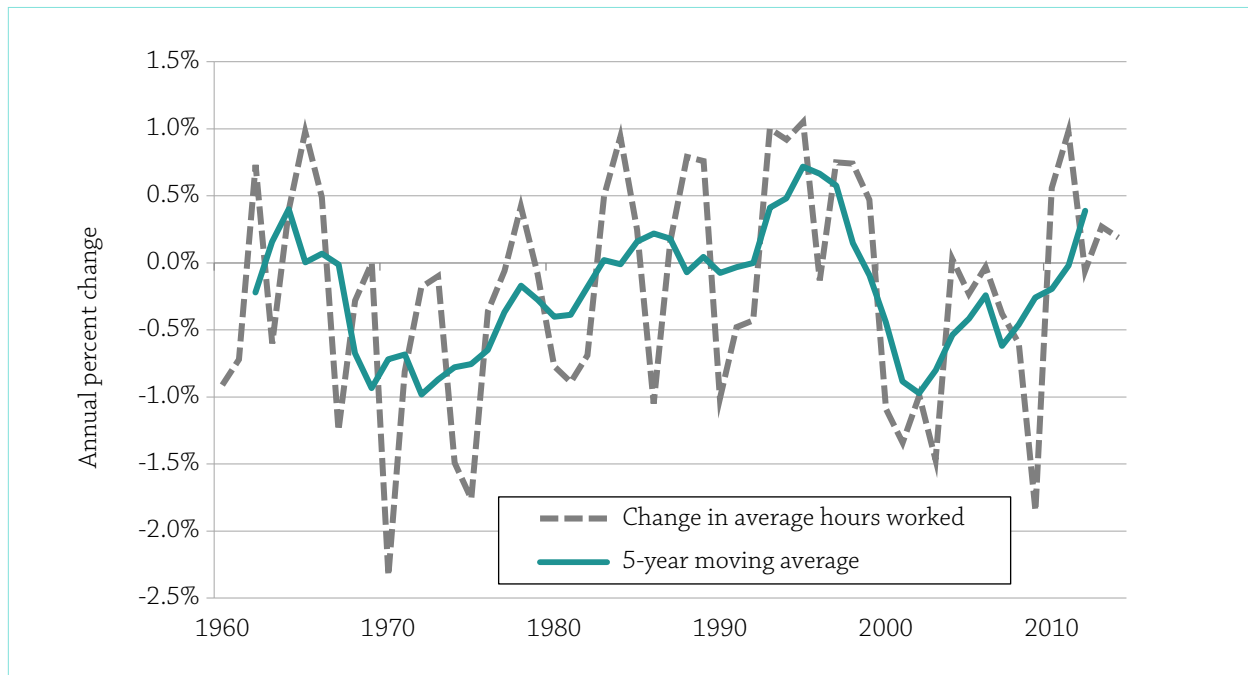
### Earnings to Compensation Ratio

The earnings-to-compensation ratio is the ratio of total labor earnings, including wages and self-employment income, to total labor compensation. Figure 28 shows that this ratio declined sharply over the three decades leading up to 1980 but since has stabilized.<sup>66</sup> The pre-1980 decline reflected increases in employer contributions for government social insurance and group health insurance, as well as growth in pension accruals, that outpaced the growth in earnings.

After rising for several decades, employer contributions to government social insurance stabilized as a share of total compensation in the early 1980s (see Figure 29), as ad hoc increases in the Social Security maximum taxable earnings and the payroll tax rate gave way to the present configuration of tax rates and wage indexing under the 1983 Social Security Amendments. In addition, much of the growth in total earnings since the mid-1980s has occurred above the Social Security maximum taxable earnings level, holding down the ratio of contributions for social insurance as a share of total compensation.

<sup>66</sup> The earnings ratio as presented here includes proprietors’ income in both the numerator and denominator.

Figure 30. Average Hours Worked: Annual Percent Change and 5-Year Moving Average (Centered), 1960–2014



Source: 2015 Trustees Report, Table V.B1.

The pension line displayed in Figure 29 reflects the current Bureau of Economic Analysis (BEA) methodology used for pensions in the national accounts. BEA switched from a cash accounting to an accrual accounting method in 2013, meaning that the data shown in the figure are not comparable to the more volatile data on employers' cash spending on their pension plans available for previous Panels to review. The newer data show that total public and private pension accruals increased up to about 1970 and then stabilized.<sup>67</sup>

The greatest uncertainty with regard to future non-wage compensation costs relates to employer-provided health care. The costs of employer-provided group health insurance have grown steadily as a share of total compensation throughout the period shown in Figure 29. Following the passage of the *Patient Protection and Affordable Care Act of 2010* (ACA), the Trustees lowered the projected rate of decline in the ratio of earnings to total compensation by 0.1 percentage point per year. This change reflects their view that the ACA provision that imposes an excise tax on employer-sponsored group health insurance, to be phased in later in the current decade, will slow the rate of growth in employer health care expenditures. The tax initially applies only to very generous health plans, but if health care costs continue to rise more rapidly than GDP it will affect more plans over time, encouraging firms and workers to shift compensation out of health insurance and into earnings.

<sup>67</sup> For more information on the change in BEA's pension accounting methods, go to [www.bea.gov/gdp-revisions](http://www.bea.gov/gdp-revisions).

In their 2015 Report, the Trustees further slowed the rate of decline of the earnings to compensation ratio based on recent evidence and the expectations of the Medicare Trustees of slower growth in employer-sponsored group health insurance premiums in the future. Because health insurance premiums are not subject to payroll tax, slower growth in this part of compensation means that a greater share will be in the form of taxable wages.

This Technical Panel believes these gradual adjustments based on historical experience are reasonable. Though, similar to the previous Panel, we also would recommend that evidence on the ACA's continued impact on health care costs be monitored carefully as it becomes available.

**Assumption Recommendation (c).** On balance, the Panel sees no compelling reason to recommend a different assumption regarding the earnings-to-compensation ratio than the Trustees' current assumptions.

### Average Hours

Figure 30 shows annual percentage changes in average hours worked per week, using a series from the Bureau of Labor Statistics for the entire economy. While the annual changes fluctuate considerably, the five-year moving average shows only one period in the 1990s with sustained positive values.

Going forward, two factors are likely to affect hours worked. On the one hand, continued increases in productivity will



allow workers to reduce hours somewhat and still maintain their level of real earnings. On the other hand, the continued increases in life expectancy—and the decline in Social Security replacement rates as the Full Retirement Age moves to 67—can be expected to raise the labor force participation of older workers. The age-sex-education mix of the population will change and that also could affect average hours worked, but OCACT finds that the effects of the changing characteristics of the workforce will have little effect on balance.

**Assumption Recommendation (d).** The Trustees assume an ultimate slight decline in hours worked of 0.05 percent per year, and the Panel sees no reason to alter this assumption. The Panel also recommends retaining the low- and high-cost assumptions of 0.05 and -0.15 percent, respectively.

### Price Differential

The final link between the productivity growth rate and real earnings growth is the differential in growth rates between the GDP price deflator (PGDP) and the CPI-W. In the context of the equation for calculating real earnings growth, including this ratio is necessary because productivity depends on real GDP, calculated as nominal GDP deflated by PGDP, but real earnings are calculated as nominal earnings deflated by the CPI-W. If the CPI-W increases more rapidly than PGDP, the effect is to lower the growth rate of real earnings relative to the growth rate of productivity.

The Trustees assume that the PGDP will grow more slowly than the CPI-W. One reason for this assumption is that the two measures are computed using different index number formulas. For the CPI-W, the price changes for broad groups of goods and services are aggregated using weights that are constant over 2-year periods, reflecting the distribution of purchases at the beginning of the period. For the GDP deflator, changes in the distribution of purchases from one quarter to the next are reflected in the computation of quarterly increases in price levels. The GDP deflator immediately reflects the fact that consumers shift their expenditures when the price for some groups of goods or services rise relative to the prices of other groups of goods and services. As a result, the GDP deflator tends to rise more slowly than the CPI-W. The Bureau of Labor Statistics reports that reflecting the behavioral response of consumers to relative price changes would have lowered

the average annual growth rate in the CPI-U (and therefore the CPI-W) between 1990 and 2011 by about 0.3 percentage point per year.

The second important difference between the GDP deflator and the CPI-W is coverage. The GDP deflator reflects the annual growth rate in prices for the items included in consumption, investment, and government expenditures, whereas the CPI-W measures the annual growth rate in prices only for the items included in consumer expenditures. Investment expenditures include growing amounts for computers and software, two goods whose prices have fallen over the last twenty-five years and are likely to continue falling. OCACT expects that the overall price of investment goods will grow more slowly than the overall price of consumer goods. On the other hand, the prices of the items in the government expenditure bundle, which consist mainly of employee compensation, are expected to grow faster than the overall price of consumer goods. The Trustees assume the net effect of differences in coverage will be to lower growth in the GDP deflator by about 0.1 percentage point relative to the CPI-W. The Technical Panel considers the Trustees' assumption to be reasonable.

Thus, the Trustees set the ultimate long-range average annual growth rate in the GDP deflator to 2.3 percent, or 0.4 percentage point below the 2.7 percent ultimate long-range average annual growth rate in the CPI-W. This difference is consistent with historical experience and seems reasonable to the Panel (see Table 8).

**Assumption Recommendation (e).** The Technical Panel recommends retaining the Trustees' assumption of a price differential between the GDP deflator and the CPI-W of -0.4 percent. The Panel also recommends retaining the low- and high-cost assumptions of -0.3 and -0.5 percent, respectively.

### Summary

The Technical Panel recommends no change in the Trustees' assumption for the ultimate level of the real earnings differential. Taken together, the Trustees' assumptions for productivity growth and the four linkages generate an intermediate real earnings growth rate of 1.15 percent per year, with low- and high-cost values of, respectively, 1.74 and 0.57 percent. The assumptions for real earnings and its components are in Table 9, with historical data in Table 10.

Table 8. Average Annual Percent Change in GDP Deflator and CPI-W, by Decade

Decade	GDP Deflator	CPI-W	Difference
2003–2013	2.10	2.47	- 0.37
1993–2003	1.83	2.22	-0.39
1983–1993	3.03	3.30	-0.27
1973–1983	7.30	7.60	-0.30
1963–1973	3.72	3.34	0.38

Note: Differences may not equal the numbers reported in the columns due to rounding.

Source: *The Long-Range Economic Assumptions for the 2015 Trustees Report*, Tables 2.4, 2.5, 3.3., 2015.

Table 9. Technical Panel Recommendations for Average Annual Real Earnings Assumptions (2025–2089)

Scenario	Average Real Earnings	Productivity Growth	Compensation Share	Earnings Ratio	Average Hours	Price Differential
Low-Cost	1.74	1.98	0.00	0.00	0.05	-0.29
Intermediate	1.15	1.68	0.00	-0.08	-0.05	-0.39
High-Cost	0.57	1.38	0.00	-0.16	-0.15	-0.49

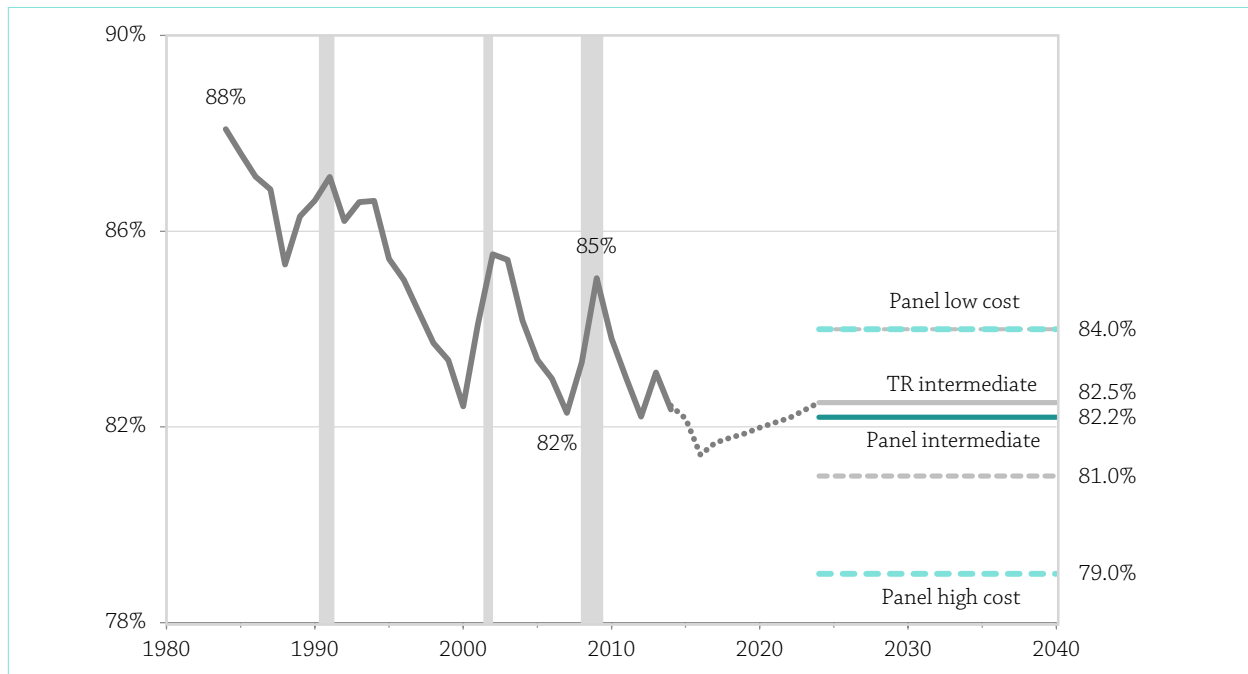
Source: *The Long-Range Economic Assumptions for the 2015 Trustees Report*, Table 3.3, 2015.

Table 10. Average Annual Real Percent Change in Average Earnings and Its Components, 1963–2013

Period	Productivity	Compensation to GDP	Earnings to compensation	Hours per week	Price differential	Residual	Average real earnings
By 10-year historical period							
1963–1973	2.59%	0.17%	-0.28%	-0.35%	0.37%	0.00%	2.50%
1973–1983	1.20%	-0.71%	-0.44%	-0.55%	-0.28%	0.00%	-0.81%
1983–1993	1.60%	0.22%	-0.26%	0.07%	-0.26%	0.00%	1.38%
1993–2003	2.13%	0.21%	0.07%	0.04%	-0.38%	0.00%	2.08%
2003–2013	1.41%	-0.39%	0.00%	-0.21%	-0.36%	0.00%	0.44%
By recent historical periods (to 2013)							
1963–2013	1.79%	-0.10%	-0.18%	-0.20%	-0.18%	0.00%	1.11%
1973–2013	1.58%	-0.17%	-0.16%	-0.16%	-0.32%	0.00%	0.77%
1983–2013	1.71%	0.01%	-0.06%	-0.03%	-0.33%	0.00%	1.30%
1993–2013	1.77%	-0.09%	0.03%	-0.08%	-0.37%	0.00%	1.26%
2003–2013	1.41%	-0.39%	0.00%	-0.21%	-0.36%	0.00%	0.44%
By economic cycle (peak-to-peak)							
Individual cycle							
1966–1973	2.37%	0.30%	-0.29%	-0.72%	0.43%	0.00%	2.08%
1973–1979	1.22%	-0.48%	-0.43%	-0.57%	-0.16%	0.00%	-0.46%
1979–1989	1.38%	-0.24%	-0.28%	-0.07%	-0.32%	0.00%	0.48%
1989–2000	1.78%	0.39%	0.05%	0.26%	-0.42%	0.00%	2.08%
2000–2007	2.14%	-0.68%	-0.23%	-0.51%	-0.14%	0.00%	0.55%
Last two cycles							
1989–2007	1.92%	-0.02%	-0.06%	-0.04%	-0.31%	0.00%	1.48%
Last three cycles							
1979–2007	1.73%	-0.10%	-0.14%	-0.05%	-0.31%	0.00%	1.12%
Last four cycles							
1973–2007	1.64%	-0.17%	-0.19%	-0.14%	-0.29%	0.00%	0.84%
Last five cycles							
1966–2007	1.76%	-0.09%	-0.20%	-0.24%	-0.17%	0.00%	1.05%

Source: The Long-Range Economic Assumptions for the 2015 *Trustees Report*, Table 3.3., 2015.

Figure 31. Historical and Projected Values of the Ratio of Taxable Payroll to Covered Earnings: Trustees' Assumptions and Technical Panel Recommendations



Source: OCACT. Shaded areas represent recessions.

## 2.4 Taxable Share of Total Earnings

Only earnings below the contribution and benefit base (also known as the taxable maximum), set at \$118,500 per year in 2015, are subject to OASDI payroll taxes and count toward Social Security benefits.<sup>68</sup> The taxable ratio refers to the fraction of total earnings in OASDI-covered jobs below this threshold and therefore subject to OASDI payroll tax. This ratio, which varies with the dispersion of earnings, is important for Social Security costs; a lower ratio has an adverse effect on Social Security's finances.

**Assumption Recommendation.** The Technical Panel recommends lowering the ultimate level for the taxable share of covered earnings from 82.5 percent in the 2015 *Trustees Report* to 82.2 percent. The Panel also recommends expanding the range of uncertainty around the taxable ratio given that it could continue to shift in the coming years. The Technical Panel recommends keeping the low-cost value at 84.0 percent, as the Trustees' currently assume, and lowering the high-cost value from 81.0 percent to 79.0 percent, a range that is modestly asymmetric around the recommended intermediate value.

<sup>68</sup> This limit changes annually with changes in the national Average Wage Index, although it did not rise between 2009 and 2011, when there was no Social Security Cost of Living Adjustment (COLA).

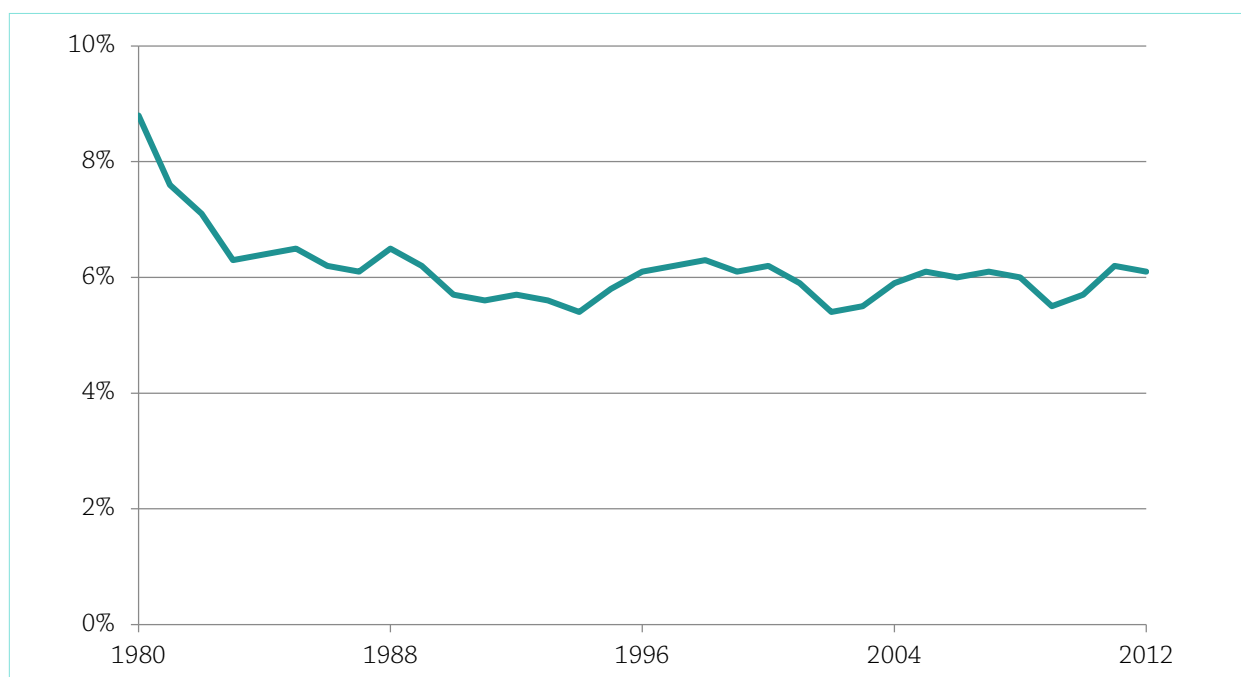
**Method Recommendation.** The Technical Panel recommends that OCACT continue to study the ongoing fluctuations in the taxable ratio to develop a more precise understanding of its underlying causes and hence a firmer basis for projecting its trajectory.

### Rationale for Taxable Share Recommendations

Since 1984, the taxable ratio has steadily trended downward, as shown in Figure 31, declining from 88.1 percent in 1984 to 82.4 percent in 2014. The exceptions to this long-running decline have been periods of recession (and the recession's immediate aftermath), when the taxable ratio briefly turned upward, only to continue its decline shortly after the recession's end.<sup>69</sup> Noting this countercyclical pattern, the 2011 Technical Panel anticipated a near-term decline in the taxable ratio to a lower post-recession level. That expectation proved accurate: the taxable ratio fell from 85.0 percent in 2009 to 82.4 percent in 2014, a level comparable to that at the peak of the prior two business cycles. In its 2015 *Long Term Budget Outlook*, the Congressional Budget Office projected that this ratio would fall to 79.0 percent by 2025, and would decline slightly thereafter (CBO 2015).

<sup>69</sup> See the detailed discussion of the taxable maximum in Whitman and Shoffner (2011).

Figure 32. Percent of Workers with Earnings Above the Annual Taxable Maximum, 1980–2012



Source: Social Security Administration, Annual Statistical Supplement, 2014, Table 4.B4.

As discussed in further detail in the 2011 Technical Panel report, the driving force behind the declining share of taxable payroll to covered earnings is the rising *share of covered earnings* paid to the highest earners. This trend reduces the fraction of covered earnings that is taxable since a larger share of covered earnings falls above the taxable maximum. As shown in Figure 32, the *fraction* of workers with earnings above the taxable maximum has fluctuated in a narrow range since 1984 (between 5.5 percent and 6.5 percent of workers).<sup>70</sup> Nevertheless, evidence presented below suggests that these fluctuations in the fraction covered are tightly correlated with fluctuations in the taxable ratio.

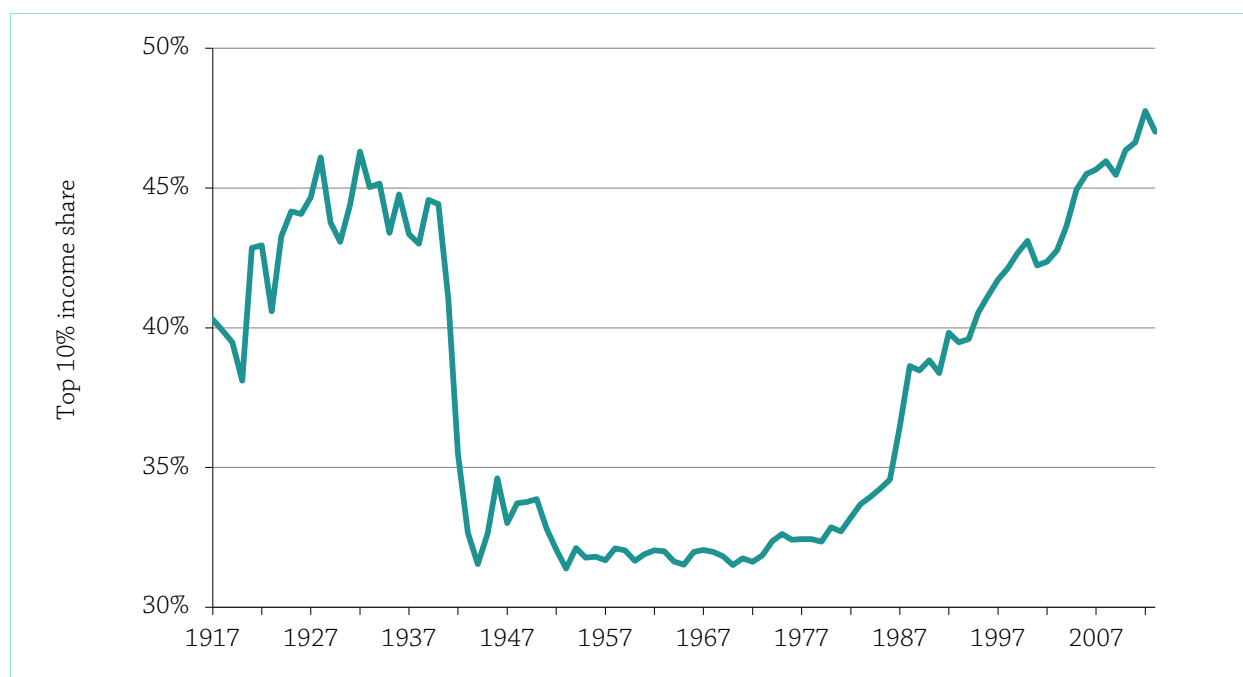
If Social Security benefits rose or fell in lockstep with the level of taxable payroll, a decline in the ratio of taxable payroll to covered earnings would have no ramifications for program finances. In reality, a decline in the taxable ratio adversely affects the system’s finances through two channels. To understand the effects of both channels,

assume that *average* wage growth for workers overall is constant, but that the growth shifts to the upper end of the income distribution.

The first channel is through the progressivity of the Social Security benefit formula used to calculate retirement and disability benefits. This formula is a progressive function of prior earnings—that is, the replacement rate of taxable earnings for low-earnings workers is higher than for high-earnings workers. Consequently, a rise in the share of covered earnings above the taxable cap means *relatively* lower earnings growth for workers of modest means. This slower earnings growth means less tax revenue for Social Security. However—because of the progressive benefit formula—the slower earnings growth does not reduce workers’ future benefits by a commensurate amount. Therefore, a rise in the taxable ratio reduces the system’s revenues by more than it reduces its benefits.

70 The decline in the share earning above the taxable maximum between 1980 and 1983 is attributable to rapid increases in the taxable maximum in 1981, 1982 and 1983.

Figure 33. The Top Decile Income Share in the U.S., 1917–2013, Excluding Capital Gains



Note: Income is defined as market income (and excludes government transfers). In 2013, the top decile includes all families with annual income above \$116,500.

Source: Piketty and Saez (2013).

A second channel by which rising income concentration erodes Social Security’s finances—separate from the progressive benefit formula—is through the Average Wage Index (AWI), which includes covered earnings above the taxable maximum. A rise in the AWI that is driven by growth in income for workers above the taxable maximum generates no additional tax revenue. But such a rise in AWI does increase benefits because the AWI is used to inflate workers’ prior earnings to current dollars when calculating their benefit levels.<sup>71</sup> Thus, a low- or moderate-income worker gets a boost in their earnings base not from the wage growth that they actually experienced but from the growth in the wages of high-income workers. Hence, a rise in covered earnings above the taxable maximum increases benefits but does not raise tax receipts.

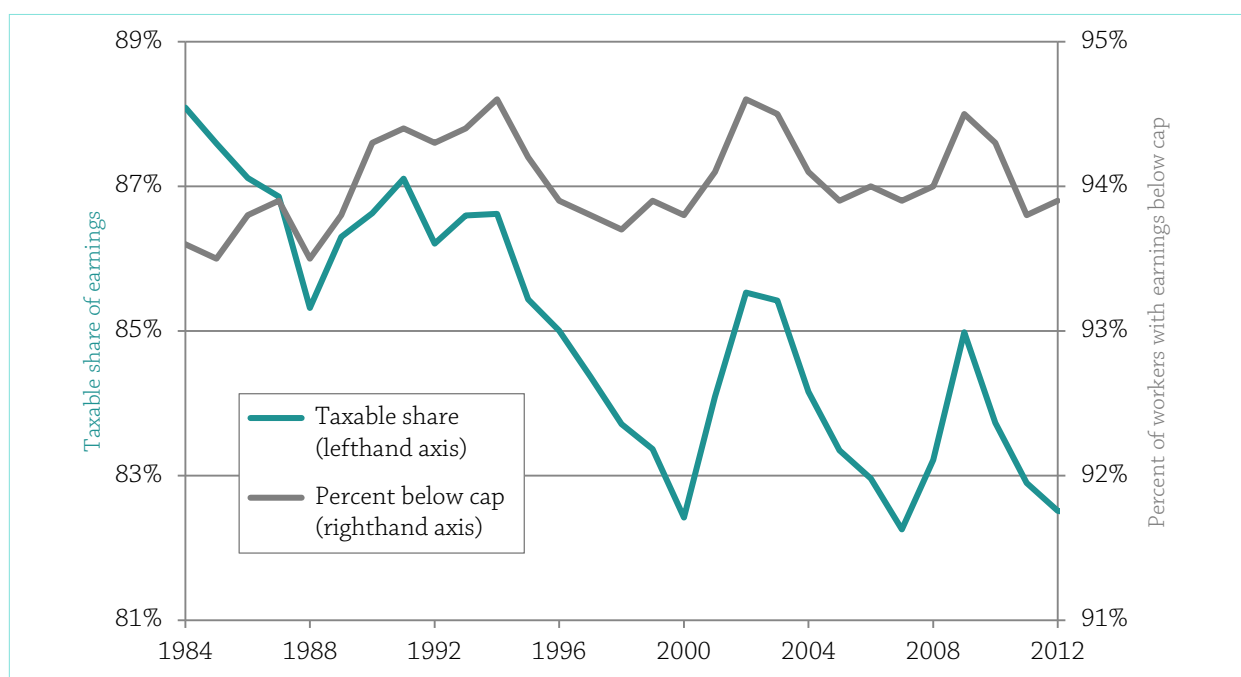
Since a key driver of the falling taxable ratio, the rising concentration of top incomes in the United States, has few historical precedents, projecting the evolution of the taxable ratio is challenging. As shown in Figure 33,

the share of U.S. wage and salary income accruing to the top 10 percent of households has risen from 32 percent to 47 percent between the late 1970s and the present. Remarkably, the advent of the Great Recession, which wreaked havoc in much of the U.S. financial sector, had almost no visible impact on the trend rise in the top decile income share.<sup>72</sup> Simultaneously, the taxable ratio data in Figure 31 do not indicate that the taxable ratio has fallen appreciably since the year 2000 (a business cycle peak). The taxable ratio reached a low of 82.4 percent in 2000, and the subsequent two cyclical lows (82.3 percent in 2007 and 82.4 percent in 2014) have not so far broken through this floor. It remains possible, however, that a sufficiently robust expansion—akin to the 1995 through 2000 expansion—will drive the taxable ratio still lower. Moreover, each of the prior three peaks of the taxable ratio (in 1993, 2002, and 2009) has been lower than the peak preceding it. This pattern suggests that the taxable ratio is likely still trending downward.

71 Specifically, in calculating a worker’s OASDI benefit, SSA first translates a worker’s earnings history into her Average Insured Monthly Earnings (AIME) by “inflating” her earnings history by the rise in AWI in the intervening years. AIME is then converted to PIA using the progressive replacement rate formula noted above. This chain of calculations means that a higher growth rate of AWI increases AIME, PIA, and benefits owed. A rise in AWI spurred by rising earnings above the taxable maximum therefore increases OASDI program liabilities without increasing program revenues.

72 The adverse impact of the Great Recession on household income shares is far more visible for the top 1 percent of households, though this effect is quite short-lived (Piketty and Saez, 2013).

Figure 34. Taxable Share of Earnings and the Percent of Workers with Earnings Below the Annual Taxable Maximum, 1984–2012



Sources: See Figures 31 and 32.

Comparing Figures 31 and 33 yields one potentially surprising contrast: while top income shares have risen continuously throughout the last three U.S. expansions *and* contractions, the taxable ratio has risen during contractions and *fallen* sharply during each expansion. The coexistence of strong cyclical fluctuations in the taxable ratio with ever-rising top income shares suggests that movements in the taxable ratio are not exclusively tied to top income shares, though clearly the two are related.<sup>73</sup> Indeed, as shown in Figure 34, the taxable ratio generally rises and falls with the fraction of workers receiving covered earnings below the annual taxable maximum. The structural fall in the taxable ratio may have been concentrated in the years 1991 through 2000; subsequent movements since 2000 may be primarily cyclical in nature. The Technical Panel recommends that OCACT explore this relationship further.

This Technical Panel’s recommendations for the taxable ratio echo those of the prior two Technical Panels (2007 and 2011):

- This Panel believes that the argument that the downward trend in the taxable ratio is likely to continue is somewhat stronger than the argument that the trend will soon reverse. But it does recognize that the

trend is unlikely to continue indefinitely. We therefore recommend a long-range intermediate assumption of 82.2 percent, which is very modestly below the Trustees’ current assumption of 82.5 percent.

- This Panel believes that the uncertainty about the future distribution of earnings is particularly high and that the currently assumed range between the low-cost and high-cost bands for the taxable ratio is too narrow given the possibility of continued change. This position echoes the 2007 Technical Panel (“High- and low-cost ratios should provide a realistic range of uncertainty”). This Technical Panel recommends a band of + 1.8 and -3.2 percentage points around the intermediate value assumed for the taxable ratio, thus placing greater weight on the likelihood of a continued decline in rather than recovery of the taxable ratio. Note that the assumed *high-cost* scenario of a taxable ratio of 79.0 percent is equal to the Congressional Budget Office’s *expected value* of the taxable share for 2025 (CBO 2015). While this Panel feels that the CBO’s projection may be unduly pessimistic, the Panel wanted to at least ensure that its high cost bound included CBO’s projected value.

73 These years are the ones for which both series are currently available.



Table 11. Summary of Technical Panel Recommendations on Inflation and Interest Rate Assumptions

Variable	Trustees			Technical Panel		
	Low	Interm.	High	Low	Interm.	High
Inflation	3.4	2.7	2.0	3.5	2.5	1.8
Real interest rate	3.4	2.9	2.4	3.0	2.5	2.0
Nominal interest rate	6.8	5.6	4.4	6.5	5.0	3.8

Source: 2015 Trustees Report, Tables V.B1 and V.B2.

## 2.5 Inflation and Interest Rates

Realized and expected rates of inflation, real interest rates, and nominal interest rates are important for projecting the operations of the Trust Funds and the Social Security program’s fiscal status. For example, post-retirement benefits are adjusted annually for inflation. The Trust Funds are invested in special-issue Treasury securities with initial rates indexed to nominal market interest rates. In addition, the Trustees and OCACT use projected nominal interest rates for discounting future cash flows when computing present values for various summary measures of system finances.

**Assumption Recommendation 1: Inflation.** The Technical Panel recommends that the Trustees lower their intermediate assumption for inflation from 2.7 percent to 2.5 percent. The Panel also recommends that the range of alternatives for inflation be asymmetric. Specifically, with a new intermediate estimate of 2.5 percent for CPI-W, the Panel recommends that the low-cost and high-cost assumptions be 3.5 percent and 1.8 percent, respectively (see Table 11). The Panel recommends this asymmetry because the range of inflation surprises appears to be larger on the high side than the low side.

**Assumption Recommendation 2: Real Interest Rate.** The Technical Panel recommends that the Trustees lower their intermediate assumption for the real interest rate from 2.9 percent to 2.5 percent. The Panel recommends that the low-cost and high-cost assumptions for real rates should be 3.0 percent and 2.0 percent, respectively.

**Assumption Recommendation 3: Nominal Interest Rate.** Consistent with the recommended changes to inflation and the real interest rate, the Technical Panel recommends that the Trustees lower their intermediate assumption for the nominal interest rate from 5.6 percent to 5.0 percent. The Panel recommends that the low-cost and high-cost assumptions for nominal rates should be 6.5 percent and 3.8 respectively.

**Method Recommendation 1.** As inflation, real interest rates, and nominal interest rates are linked theoretically

and empirically, the Technical Panel recommends that they be analyzed and discussed together, not separately.

**Method Recommendation 2.** In addition to reporting comparisons of historical data and projections by other organizations, the Technical Panel believes that the Trustees and OCACT should also consider: 1) evidence from surveys of professional forecasters; and 2) evidence inferred from market outcomes.

### Rationale for Method Recommendations

The Technical Panel believes that the Trustees can improve their methods for projecting inflation and interest rates by analyzing the measures together, rather than separately, and considering insights from surveys of professional forecasters and models of market transactions that allow inferences about expectations held by market participants.

### Combining Analysis of Inflation and Interest Rates

The interest rates on the bonds in the Trust Funds are indexed to market rates on long-term Treasuries at the time they are issued. Thus, the nominal interest rate has a direct impact on system finances, is part of the projection of system finances, and is relevant for discounting future shortfalls of finances when reporting such magnitudes. The annual cost-of-living adjustment (COLA) for benefits is based on the CPI inflation rate. Just as the Trustees consider real productivity growth as part of projecting taxable wage growth, so too the Trustees consider real interest rates as part of projecting the system’s finances.<sup>74</sup> For moderate rates, the following relationship is often used as shorthand for the relation among the three economic factors under consideration:

$$\text{Nominal Interest Rate} - \text{Inflation} = \text{Real Interest Rate}$$

74 As noted in the Trustees Report (p. 104), “The real interest rate is defined as the annual yield rate for investments in these securities divided by the annual rate of growth in the CPI for the first year after issuance. The real rate shown for each year reflects the actual realized (historical) or expected (future) real yield on securities issuable in the prior year.”

Table 12. Average Annual Nominal Interest Rate, Inflation Rate, and Real Interest Rate

Period	Average annual nominal interest rates	Average annual change adjusted CPI-W	Average annual real interest rates
By 10-year historical period			
1973–1983	9.46%	7.60%	1.49%
1983–1993	8.68%	3.30%	5.88%
1993–2003	5.90%	2.22%	3.89%
2003–2013	3.31%	2.47%	1.07%
By recent historical periods (to 2013)			
1973–2013	6.84%	3.87%	3.06%
1983–2013	5.96%	2.66%	3.59%
1993–2013	4.61%	2.34%	2.47%
By economic cycle (peak to peak)			
Individual cycle			
1966–1973	6.12%	4.05%	1.84%
1973–1979	7.74%	7.60%	-0.13%
1979–1989	10.52%	5.02%	5.54%
1989–2000	6.78%	2.63%	4.38%
2000–2007	4.60%	2.64%	2.19%
Last two cycles (1989–2007)	6.08%	2.63%	3.52%
Last three cycles (1979–2007)	7.62%	3.48%	4.24%
Last four cycles (1973–2007)	7.57%	4.20%	3.45%
Last five cycles (1966–2007)	7.29%	4.17%	3.17%

Note: This table reports an adjusted CPI-W that reflects BLS improvements to the Index. See *Long-Range Economic Assumptions for the 2015 Trustees Report*, Section 2.6 Appendix for a complete explanation of the adjustments. Nominal rates are the rates on new issues.

Sources: Data provided by OCACT and *Long-Range Economic Assumptions for the 2015 Trustees Report*, Tables 2.2 and 5.2.

A natural starting place for considering the ultimate assumptions is the historic record of the rate on ten-year Treasury bonds (an approximation to the actual rate on newly acquired bonds for the Trust Fund) and the inflation rate as measured for the COLA. These two time series also provide the historic record of the real interest rate

(See Table 12). Given the strong interactions among the determinants of inflation and interest rates, consideration of the real rate helps select the ultimate assumptions. The real rate should be considered in the context of labor force, capital, and productivity growth rates.

Anticipations of the future of inflation matter for determining both wages and nominal interest rates. These determinations are also affected by uncertainty about future inflation, and so, by the subjective probability distributions of possible inflation rates held by different participants in the economy. Thus, it is necessary to consider two distinct real interest rates. The relation above applies to ex-post rates: the ex-post “real interest rate” is the nominal rate of interest less the realized inflation rate. While the *realized* inflation rate reduces the ex-post real interest rate point-for-point for a given nominal interest rate, nominal interest rates are affected by expectations of future inflation. The ex-ante real interest rate is the nominal interest rate less some measure of “the *expected*” inflation rate. The expected inflation rate is affected by the diversity of inflation expectations and by any inflation risk premium that may be present in market rates. Tax rates also matter for the relationship between real and nominal interest rates, since taxation is based on nominal incomes.

The ex-ante real rate of interest affects asset demands and thus influences the market nominal rate, which affects the interest income of the Trust Funds, and the ex-post rate matters for the real value of the Trust Funds. Thus, both anticipated and realized inflation need to be considered for the projections. For the ultimate assumptions, the Technical Panel believes it is appropriate to continue to assume that these two rates are the same.<sup>75</sup> Nevertheless, the distinction is worth drawing as it results in additional sources of evidence to consider when selecting the ultimate rate and underlines a role for inflation surprises.

Given these interactions, the Panel believes that the Trustees should present their analysis of inflation and interest rates together and should expand background research on the process of drawing inferences on these variables.

### Tapping New Sources of Information

The Panel also thinks that the Trustees and OCACT should examine surveys of professional forecasters and expectations inferred from market transactions of bonds and derivatives.

*Surveys of professional forecasters.* The Panel recognizes that averaging projections from a group of separate knowledgeable forecasters has the potential to improve projections compared with a single projection from a single group. However, many forecasters focus on a horizon that is much shorter than 75 years. And there remains the possibility of cognitive biases, which could be larger or smaller than in

75 If we were considering an economy in a steady state, then the equality of the two real rates would be an obvious implication of standard modeling. However, the projection is based on using a single rate of interest meant to reflect the average over the ultimate period, without any expectation that the economy is in a steady state. Thus, there is no necessary reason for the two rates to be equal, with possible differences reflecting views on expectation formation and an assumed pattern of the signs of inflation “surprises.”

the process followed by the Trustees. Ongoing research is focused on examining the successes, limitations, and biases present in such surveys and exploring methods of drawing inferences that might be better than taking answers to survey questions literally.<sup>76</sup> The Panel views this as an appropriate activity to be reviewed by OCACT and the Trustees as part of framing the underlying assumptions made by the Trustees and selecting ultimate rates.

*Market-based analyses.* An investor in bonds has multiple choices for any given horizon. For example, seeking to invest for 20 years, an investor could choose between a 20-year bond and a 10-year bond with the plan to purchase another 10-year bond in 10 years, with an uncertain interest rate. Conversely, an investor looking to cash out in 10 years could choose a 10-year bond, or could purchase a 20-year bond with the intention of selling it in 10 years. In this case, the price of a 20-year bond with ten years remaining in 10 years is a source of risk. Thus, investors considering alternative plans would think about the future of interest rates as part of the investment decision process. The market as a whole consists of many investors with different horizons, uncertain horizons, and different perceptions. Market rates, incorporating both expectations and the term premia on bonds reflect the views and plans of market participants. Thus, any attempt to infer expectations of future interest rates from the yield curve needs to recognize the presence of time-varying term-premia.

An investor looking at real returns can purchase a real bond (TIPS) or purchase a nominal bond and face uncertainty about the inflation rate. In this case, attempts to infer inflation expectations must account for the presence of inflation risk premia that vary over time and by liquidity in the markets for different bonds.

The 2011 Technical Panel discussed expectations of future rates by examining TIPS rates, using the basic “expectations hypothesis.”<sup>77</sup> However, the basic expectations hypothesis has a poor prediction record.<sup>78</sup> In response, a large literature has developed to separate out the expectations from the risk premium.<sup>79</sup> These models decompose yields into a risk-adjusted component and a term-premium component. By removing the term premia from the yields, these risk-adjusted components then satisfy the expectations hypothesis, and risk-adjusted longer term interest

76 See, for example, Andrade, Philippe, Richard K. Crump, Stefano Eusepi, and Emanuel Moench, Fundamental Disagreement, Federal Reserve Bank of New York Staff Reports 655, Revised November 2014.

77 Brown and Pennacchi (2015) note that “TIPS are less liquid than nominal U.S. Treasuries, and there is evidence that their yields became unrealistically high (and prices unreasonably low) during stress periods such as the 2008–2009 financial crisis.” For evidence that TIPS were under-priced relative to nominal Treasuries and inflation swaps, see Haubrich, Pennacchi, and Ritchken (2012) and Fleckenstein, Longstaff, and Lustig (2014).

78 Adrian, Crump, Diamond, and Yu (2015 forthcoming).

79 For example, see Piazzesi, Salomao, and Schneider (2015), and Abrahams, Michael, Adrian, Crump, and Moench (2015).

rates simply reflect expectations about the path of future shorter term interest rates. This adjustment is important because the term premia vary over time. Thus, just as the Trustees reflect on different historical periods when making inferences directly from observed rates, so too one could examine models fitted to different time periods. As some of the data series are quite long, one could examine the quality of out-of-sample projections as well. The Technical Panel has not engaged in such an effort, but calls on OCACT to proceed in this direction. A number of term-structure models are updated and presented publicly on a regular (even daily) basis.<sup>80</sup> Without an extensive assessment of alternative models, no single model should be given too much weight.

In addition to inferences from bond markets, one can make inferences from derivatives markets. Particularly, it is possible to estimate inflation expectations from the market for inflation derivatives.<sup>81</sup> Such estimation of expectations requires risk adjustment and removal of other factors that affect the pricing of derivatives, especially perceptions of risk and levels of risk aversion.

Given the widespread view that market-based estimates contain important information, the use of and discussion of these approaches will lend additional credibility to the Trustees' projections.

## Rationale for Assumption Recommendations

The Technical Panel recommends that the Trustees lower their assumptions for inflation and interest rates for the reasons discussed below.

### Inflation

For the ultimate rate, the *Trustees Report* assumes that the average annual growth rates in the CPI-W and CPI-U will be roughly equal and differ from the long-range average annual growth rate of the consumption portion of the GDP deflator (PGDP\_C less CPI-W) by -0.30 percentage points. The Panel considers these relationships to be reasonable.

80 By the New York Federal Reserve Bank, the San Francisco Bank and the Board of Governors of the Federal Reserve System. The point being there is not a single agreed-on model, just an agreed-on approach. The New York Federal Reserve Bank has produced projections of nominal returns on 10-year Treasury bonds. See Adrian, Tobias, Richard Crump, Peter Diamond, and Rui Yu, *Discounting the Long-Run*, 2015.

81 See, for example, Feldman et al. (2015), and Kitsul and Wright (2013). These papers focus on probabilities incorporating differences in marginal utilities across states and argue for their policy relevance. While there is a strong case for their relevance for some purposes, for projecting the financial status of the Social Security Trust Funds, there would need to be an adjustment for the risk premium element in these prices, paralleling the adjustment for term premia discussed in the text.

The Trustees set the assumed intermediate ultimate rate of increase in the CPI-W to 2.7 percent for the 2015 *Trustees Report*, and to 3.4 and 2.0 percent for the low-cost and high-cost projections, respectively. Although the Panel thinks that the 2.7 rate is within the range of reasonable assumptions, the Panel recommends a lower number for the intermediate assumption: 2.5 percent.

Central to consideration of long-run inflation is assumptions about monetary policy.<sup>82</sup> In response to the Federal Reserve's increased commitment to avoiding high levels of inflation, the Trustees have significantly lowered the intermediate assumption from 4.0 percent in the 1996 *Trustees Report* to 2.8 percent in the 2004–2013 Reports and to 2.7 percent in the 2014 and 2015 Reports. The Federal Reserve has spoken in terms of a 2-percent inflation rate target. This current target is based on the personal consumption expenditures price index (PCE) implying a Federal Reserve target rate of 2.3 percent relevant for consideration of the Trustees' assumption for CPI-W.

Several issues are relevant for interpreting the implications of this policy stance on the long-run average inflation rate. First, the Fed is unlikely to hit its target year after year.<sup>83</sup> Second, the Fed may change its target—indeed the Fed is currently reviewing the 2-percent target. Third, personnel at the Fed will change over the next 75 years, which could lead to higher or lower inflation regimes. And fourth, the charge to the Fed may itself change, which could lead to higher or lower targets.<sup>84</sup>

We note that OCACT cites Global Insight, Inc., Macroeconomic Advisers, Moody's Analytics, the Office of Management and Budget (OMB), and the Congressional Budget Office (CBO), covering different time periods. All were reported as having lower inflation projection rates than the Trustees.<sup>85</sup>

82 Another issue is the role of changing patterns of international trade.

83 Indeed, rates have been below the target since May 2012 and are likely to remain below the target for some period further. It is not clear whether all the key decision-makers view the target as something to be approached symmetrically; some decision-makers are more concerned with rates above the target than with those below the target. In addition to the so-far limited ability of the Fed to increase inflation, it is also unclear how successful the Fed would be in the event of a sizable inflationary shock, such as the oil price shock in the 1970s, although recent gyrations in oil prices have not had a comparable impact on overall inflation. Variance in inflation rates would compound somewhat differently from the effects of a constant rate at the mean. If FOMC had only small deviations, this would matter little.

84 Some have argued that the Fed's dual mandate to consider both inflation and employment should be changed to a consideration only of inflation, as is the case with some other central banks. This might lower the choice for a 75-year horizon. On the other hand, in light of the large costs of the Great Recession, and the limitations on policy coming from the zero lower bound on interest rates, some have argued for a higher target than 2 percent, although that has not seemed to have had much leverage. And some want more radical changes to the monetary system, such as a return to a gold standard or a focus on virtual currency displacing much of the current role of fiat currency.

85 We note that for the 30-year derivative contract, the implied rate of inflation in Brown and Pennacchi (2015) is less than 2.4 percent, a rate that incorporates differences in marginal utilities with different inflation rates.

In light of the Fed's 2-percent target and the projections of other organizations, the Technical Panel thinks that the Trustees should continue to slowly lower the ultimate inflation assumption. While positive shocks to the inflation rate may well be larger than negative shocks, the Fed may be able to offset positive shocks more quickly than negative shocks. On balance, the Panel suggests that the band be asymmetric.

The discussion of possibly higher and lower inflation rates has led the Panel to conclude that the bands around the intermediate assumption should be larger in the upward direction—1.0 as opposed to 0.7, the symmetric band difference in the Trustees' Report.

### Nominal and Real Interest Rates

The Trust Funds hold special-issue Treasury securities. At issue, the bonds have an interest rate equal to the average market yield on all of the outstanding marketable U.S. obligations that are due or callable more than 4 years in the future. OCACT reports that the rates on the special issue securities are approximately equal to the 10-year Treasury rate. Therefore, the analysis requires projecting the nominal interest rate on 10-year bonds, while recognizing that inflation expectations as well as actual inflation affect the realized real rate. It seems appropriate to focus directly on real rates, trying to select an ultimate real rate over a long period with an unknown macro environment at the beginning. This exercise is different than considering how the economy might behave over an extended time period at different constant inflation rates, because business cycles are not expected to disappear.

For the 2015 *Trustees Report*, the Trustees assume ultimate real interest rates (effective annual real yields on special public debt obligations issuable to the trust funds by the U.S. Treasury) of 2.9 percent for the intermediate case. They assume 3.4 percent and 2.4 percent for the low-cost and high-cost, respectively.

The Trustees consider two primary data sources when setting assumptions for real and nominal interest rates. First, they rely upon the average realized interest rate over selected historical periods. This is reasonable, especially for periods that have similar monetary policy regimes. For example, the realized average real interest rate over the post-1987 period is a useful indicator of the likely future rate because monetary policy was stable with few periods of inflation surprises that distort real realized rates. During this period, the CPI growth rate averaged 2.7 percent and the real interest rate averaged 3.1 percent.

However, in this period the federal government ran large budget deficits much of the time, potentially placing upward pressure on real interest rates during the late 1980s to the early 1990s. The CBO's current law baseline projection estimates deficits that are relatively flat as a fraction of

GDP for the near term, but that become notably larger in succeeding years. However, it is reasonable to believe that the Federal government may restore closer fiscal balance over the remainder of the long-range period.<sup>86</sup> Thus, the Trustees believe an ultimate real interest rate of 2.9 percent for the intermediate assumption is appropriate. Of course, if it is expected that the government debt will grow to a level higher than what investors are willing to absorb, then a higher real interest rate assumption would be reasonable.

The Trustees cite interest rate projections from Global Insight, Inc., Macroeconomic Advisers, Moody's Analytics, the Office of Management and Budget (OMB), and the Congressional Budget Office (CBO), covering different time periods. Apart from CBO, all were reported as having lower projected real interest rates than the Trustees. Currently, the long-run projected *nominal* rate is roughly 3.9 percent in the model in Adrian et al. (2015), substantially below the currently assumed nominal rate of 5.6 percent.

The Panel suggests a reduction in the projected real interest rate of 0.4 (with no change in the bands). In light of the suggested decrease in the inflation rate, the implied projected nominal rate is 5.0, a decline of 0.6.

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86 According to the CBO's 2015 Long-Term Budget Outlook (p.1), "The economy's gradual recovery from the recession, the waning budgetary effects of policies enacted in response to the weak economy, and other changes to tax and spending laws will cause the deficit to shrink in 2015 to its smallest percentage of GDP since 2007, CBO projects—2.7 percent, a much smaller percentage than the recent peak of nearly 10 percent in 2009. Throughout the next decade, however, an aging population, rising health care costs per person, and an increasing number of recipients of exchange subsidies and Medicaid benefits attributable to the Affordable Care Act would push up spending for some of the largest federal programs if current laws governing those programs remained unchanged. Moreover, CBO expects interest rates to rebound in coming years from their current unusually low levels, raising the government's interest payments on debt. Budget deficits would not substantially increase at first, but eventually they would begin to rise. They would approach 4 percent of GDP toward the end of the 10-year period spanned by CBO's baseline budget projections, the agency anticipates." <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/50250-LongTermBudgetOutlook-3.pdf>



### ■ 3.1 Presentation of Uncertainty

Past Technical Panels have consistently recommended improvements in the analysis and presentation of uncertainty about long-run Social Security finances in the *Trustees Reports*. With help from the Office of the Chief Actuary (OCACT), the Trustees have made significant progress toward these recommendations, including the development of stochastic modeling capabilities and changes in the presentation of data. The 2015 Technical Panel makes five recommendations that would continue the trend in improvement in the presentation of uncertainty.

**Presentation Recommendation 1.** The Technical Panel recommends that, for the key individual assumptions, the Trustees set and disclose standards for the selection of low-cost and high-cost alternative assumptions used to demonstrate the program's financial sensitivity to each assumption. Acceptable standards would ensure that the alternative assumptions are plausible and comparable. For example, the Trustees could conceptually target the 10<sup>th</sup> and 90<sup>th</sup> percentile range of long-run averages for each assumption.

**Presentation Recommendation 2.** The Technical Panel recommends referring to the low-cost and high-cost alternatives as the “Higher Trust Fund Balance” and “Lower Trust Fund Balance” alternatives, respectively.

**Presentation Recommendation 3.** The Technical Panel recommends the use of plausible integrated scenarios to illustrate these Higher and Lower Trust Fund Balance estimates of the program's long-run financial status. These scenarios would replace the low-cost and high-cost variants as currently presented in the *Trustees Report*.

**Presentation Recommendation 4.** The Technical Panel recommends periodic comparison of past key assumptions, cost rate projections, and taxable payroll projections to their realized values 5, 10, and 20 years later.

**Presentation Recommendation 5.** The Technical Panel recommends increasing the prominence of summary data about the uncertainty of projections.

More specifically, the Panel recommends:

- Summarizing the effects of uncertainty about individual key assumptions in the Overview to the *Trustees Report*;

- Including summary data from stochastic analyses where uncertainty is discussed; and
- Summarizing large data sets disclosed in the body of the report in a way that provides analytical insight and disclosing the complete data sets in the appendices to the report or in online databases.

#### Discussion

Projecting the financial condition of the Social Security Trust Funds 75 years into the future entails many assumptions about what may happen over that period. It is difficult to imagine the degree of uncertainty associated with how key variables, such as wage growth and life expectancy, will behave over a period that is longer than most Americans have lived. Yet, assumptions about long-run uncertainty must be made in order to understand how potential differences from assumed experience may affect the Social Security program. The Technical Panel offers several recommendations that will improve understanding of the uncertainty associated with the Trustees' projections.

#### Disclose Standards for the Selection of Assumptions

It is clear that the intermediate assumptions receive serious attention and that they provide a consistent set of assumptions that result in the Trustees' best estimate of future Trust Fund experience. The alternative assumptions, demonstrating the Trustees' best estimate for a disclosed range of outcomes, should receive similar consideration.

The publicly available information, however, does not provide a clear indication about how the alternative assumptions are selected or standards that the Trustees apply to the selection of assumptions. Such disclosure could help readers understand the amount of uncertainty associated with individual assumptions, the relative sensitivity of financial results to different assumptions, and where their own estimates of future experience lie within the Trustees' estimated range.

Ideally, the Trustees would determine probability distributions for each of the key assumptions and select alternative assumptions based upon a consistent percentile range. This would simplify the assumption setting and disclosure process. However, the degree of uncertainty around 75-year projections of the key assumptions raises valid questions about the ability to estimate these distributions. Unless

and until these questions can be resolved, the Technical Panel recommends the disclosure of assumption-setting standards that will help readers conceptualize and compare the sensitivity of financial results to individual key assumptions.

The Panel offers several guidelines for the assumption-setting standards. First, the Panel recommends that key assumptions individually reflect a plausible range, based on historical experience, expert opinion, statutory constraints, and so on. The Panel recommends that the alternative assumptions encompass a wide range of potential future experience, but not so wide as to be construed as the minimum or maximum boundaries of future experience. Aside from providing a false sense of certainty, projections characterized as limits can damage confidence in the projections when actual experience exceeds their thresholds. Finally, the Panel recommends attempting to set alternative assumptions at a consistent degree of likelihood to improve comparability. This would allow readers to ascertain which assumptions are most likely to drive changes in the financial status of the program. If the underlying distribution is asymmetrical—or at least thought to be asymmetrical—the alternative assumptions should reflect the asymmetry.

As an example, the Trustees could disclose that they set their alternate assumptions by targeting the 10<sup>th</sup> and 90<sup>th</sup> percentiles of their considered probability distribution for each key assumption. If they used this standard to set the alternative assumptions, readers would have a basis for conceptualizing the plausibility and comparability of the Trustees' assumptions. Further disclosure by the Trustees, such as a record of historical ranges and their basis for selecting the ranges, could substantiate their application of the standard.<sup>87</sup>

### Appropriate Labeling

The Technical Panel recommends the use of more precise labels for low-cost and high-cost scenarios. The “low-cost” and “high-cost” monikers can be misleading. For example, lower real wage growth is associated with the high-cost alternative. This may be counter-intuitive when discussing

the effect on benefits paid because lower real-wage growth actually lowers the real cost of benefits paid. The higher net cost results from the countervailing effect of reduced revenue flows. Similarly, those who possess a broader perspective may not interpret the names in the narrow context of trust fund finances. Higher mortality rates, from an increase in the prevalence of smoking, for example, may not seem like a “low-cost” scenario from a broader perspective. To be more precise, the Panel recommends referring to what is currently called the “low-cost” as the “Higher Trust Fund Balance” projection and to what is currently called the “high-cost” as the “Lower Trust Fund Balance” projection.<sup>88</sup>

### Integrated Scenarios

The Technical Panel recommends the use of plausible integrated scenarios to illustrate higher and lower trust fund balance estimates of the program's long-run financial status. Currently, low-cost and high-cost scenarios are determined by setting all key assumptions at the selected limits of the ranges used to demonstrate sensitivities to individual assumptions. The culmination of setting each key assumption at an extreme value is a relatively unlikely projection, which could lead readers to discount its usefulness.<sup>89</sup> Further, perceptions of extreme scenarios could damage confidence when actual results fall outside of their bounds, as occurs on occasion.

Constraining assumption sets to the realm of plausible outcomes—either individually or collectively—improves deliberations about the assumptions, recognizes that actual experience may fall outside of illustrated ranges, and results in projections that are accessible by non-technical audiences. Readers can relate the alternative financial results with familiar scenarios. More broadly recognized scenarios could attract broader attention to the effects of uncertainty, particularly as the narrative may appeal to non-technical audiences. Believable scenarios could help to validate or improve stochastic results. And, the placement of plausible, integrated scenarios in the *Trustees Report* could generate a curiosity about other scenarios that leads to expanded scenario analysis and improved understanding of uncertainty.

<sup>87</sup> Uncertainty associated with the projections comes from the design of the model as well as from the choice of assumed parameters and this additional source of uncertainty should be identified, even if it cannot be quantified. Similarly, the stochastic projection relies on a simplified specification of the behavior of some of the key variables and so is also subject to model uncertainty that is not captured in the calculated and reported distribution of outcomes.

<sup>88</sup> The Panel does recognize that some may prefer that the Social Security and Medicare Trustees' Reports use the same terminology; and the terms “Higher Trust Fund Balance” and “Lower Trust Fund Balance” do not have much meaning in the context of Medicare Parts B and D.

<sup>89</sup> Take, for example, two independent assumptions that each has a 10-percent probability of occurring. The probability of both occurring is 1 percent. This effect is compounded by the number of assumptions set at their limits in the current alternative projections. The Trustees disclose that “Actual future costs are unlikely to be as extreme as those portrayed by the low-cost or high-cost projections”—in part because of this methodology.



Table 13. Illustrative Assumptions for Faster Economic Growth and Slower Economic Growth Scenarios

Ultimate assumption	Intermediate assumptions 2015 <i>Trustees Report</i>	Faster economic growth	Slower economic growth
<b>Demographic:</b>			
Fertility	2.0	2.1	1.9
Mortality improvement	0.78	0.94	0.63
Net immigration	1,155	1,214	1,087
<b>Economic:</b>			
Real-wage differential	1.17	1.74	0.61
CPI	2.7	2.8	2.6
Real interest rate	2.9	3.0	2.8
<b>Programmatic:</b>			
Disability incidence	5.4	5.1	5.7
Disability termination	10.4	10.5	10.3

Note: The reported rate of improvement in mortality is the average over the entire projection period, which is slightly higher than the ultimate rate assumed for the last 50 years of the projection period.

Source: 2015 *Trustees Report*, and Technical Panel example.

In an effort to assist in the development of suitable scenarios, the Panel has devised examples of reasonable integrated scenarios. The first example examines a potential scenario for faster economic growth than assumed in the intermediate assumptions (see Table 13).<sup>90</sup> The scenario assumes that real wages increase more rapidly than the intermediate assumption as a result of faster economic growth, and that the United States experiences a higher rate of inflation. Real interest rates are also assumed to be higher than the intermediate assumption. More rapid economic growth could affect the demography of the United States as well. The faster growth scenario illustrated here assumes that higher levels of pay lead to increased fertility and lower incidence of disability relative to the intermediate assumptions. Net immigration to the United States is higher than assumed in the intermediate scenario, as the attractiveness of work in this country is

greater. Finally, the scenario assumes that a faster rate of economic growth results in healthier lifestyles and greater spending on health care research, which has the effect of increasing life spans more rapidly than assumed in the intermediate scenario.

The second example examines a potential scenario for slower economic growth than assumed in the intermediate assumptions. The slower growth scenario assumes opposite effects on individual assumptions, relative to the more rapid growth scenario. The rates of wage growth, inflation, and interest are all lower than their intermediate assumptions. Fertility, immigration, and mortality improvement rates are lower, and disability incidence is higher than assumed in the intermediate assumptions.

90 The integrated scenario assumptions in Table 13 are based upon the individual assumption ranges in the 2015 *Trustees Report*. Each integrated scenario assumption is an interpolated value between the Trustees' intermediate assumption and either their high-cost or low-cost assumption. The interpolations are weighted such that the assumptions disclosed as having the greatest influence on the 75-year Actuarial Balance also exhibit the greatest deviations from their intermediate assumptions.

The Technical Panel recognizes that this recommendation entails the use of assumptions that differ from the sensitivity assumptions (Presentation Recommendation 3), and some may object to the loss of this simplicity. The Panel suggests including in the report both the assumptions used to demonstrate the sensitivity to individual assumptions (see discussion of Presentation Recommendation 5) and the assumptions used for the integrated scenarios. This information would focus readers on the uncertainty of assumptions where the individual assumptions are analyzed and the uncertainty of the intermediate projection where long-range estimates are analyzed.

### Analysis of Historical Projections

The Technical Panel recommends periodic comparison of historical key assumptions, cost rate projections, and taxable payroll projections to their realized values 5, 10 and 20 years later. Emphasis should be placed on analyzing the key assumptions, since much of the uncertainty associated with the projected financial estimates derives from the uncertainty associated with the key assumptions. In addition, analysis of the differences between a few key projected financial aggregates—such as the cost rates and taxable payroll—and their realized values may help to inform potential modeling improvements.

The Panel recommends that each analysis examine differences over an extended period of time—enough to distinguish the effects of relative fluctuations around the long-term average from systemic changes to the nature of the variable. The Panel also recommends including comparisons to publicly available projections made by other reputable institutions, such as the Bureau of Labor Statistics, the Congressional Budget Office, and the President’s Budget. To the extent that assumed values differ, these comparisons may help to identify potential improvement in the methodologies used to make the assumptions.

Analyses of historical projections would provide another means of informing the public about the uncertainty

associated with long-range projections. They may also provide insights that could lead to improvements in projection methodologies or better understanding of the uncertainty around key assumptions.

### Data Presentation

The *Trustees Report* has several potential audiences, and reorganization of where certain data are presented may help to better communicate important information. The Panel generally recommends placing summary data relevant to all audiences in the body of the report, using tables and/or graphs, and more detailed data for technical audiences in appendices and/or publicly available databases. Reducing the quantity of data on a page can help audiences focus on the critical evidence produced by the analysis. The ease of recognition offered by good summarization could help to attract attention to the presentation of uncertainty in the *Trustees Reports*. The Panel has several suggestions for summarizing information more succinctly and presenting it more prominently.

Uncertainty is synonymous with the use of assumptions, and the Technical Panel recommends that the uncertainty associated with key assumptions be demonstrated at the point where the assumptions are introduced. In the 2015 *Trustees Report*, two sections (II.C and a subsection of II.D) in the Overview chapter introduce key assumptions and the uncertainty associated with them. The Technical Panel recommends merging this information into one section and introducing a table that includes expanded information about the sensitivity of the key assumptions (as in Table 14). Table 14 relies on a single summary measure—the 75-year Actuarial Balance—to demonstrate the sensitivity of Trust Fund finances to uncertainty about each assumption. Additional data on the sensitivity of key assumptions would still be included in an appendix, as it was in the 2015 *Trustees Report*. Table 14 provides rapid identification of the significance of key variables to long-run finances and the placement of the table associates the uncertainty about results with the presence of assumptions.

Table 14. Key Long-Range Assumptions and Estimated Uncertainty

Long-range Assumption	Intermediate	Higher trust fund balance sensitivity			Lower trust fund balance sensitivity		
	Expected average	Expected average	Change in expected average	Effect on actuarial balance	Expected average	Change in expected average	Effect on actuarial balance
<b>Demographic:</b>							
Fertility	2.0	2.2	0.2	0.34	1.8	-0.2	-0.33
Mortality improvement	0.78	0.41	-0.37	0.45	1.18	0.40	-0.46
Net immigration	1,155	1,465	310	0.21	850	-305	-0.25
<b>Economic:</b>							
Real-wage differential	1.17	1.80	0.63	1.00	0.55	-0.62	-1.01
CPI	2.70	3.40	0.7	0.15	2.00	-0.7	-0.16
Real interest rate	2.90	3.40	0.5	0.21	2.40	-0.5	-0.21
<b>Programmatic:</b>							
Disability incidence	5.4	4.3	-1.1	0.27	6.5	1.1	-0.27
Disability termination	10.4	12.6	2.2	0.04	8.3	-2.1	-0.03

Source: 2015 *Trustees Report*, and Technical Panel example.

The stochastic model provides important insights to uncertainty that neither the sensitivity analysis nor a scenario analysis provide. The assumptions underlying the stochastic model are consistent with the intermediate assumptions, and thereby provide a historically-based perspective of uncertainty about the intermediate projection. Critically, it provides the best available means of assigning relative likelihood to variations from the intermediate projections in the *Trustees Reports*. The Technical Panel recommends including a stochastic range for each long-range financial measure based on the intermediate assumptions.

The Panel notes the importance of disclosing what historical data are used to generate the results of the stochastic model, since the results may be inconsistent with the Trustees' best estimates of future uncertainty. For example, a deterministic scenario used to illustrate the uncertainty of OASDI cost rates may be at the 90<sup>th</sup> percentile of simulations based on historical deviations from the intermediate assumptions. However, the scenario may not be intended to communicate that the Trustees assign a 90-percent chance that future Trust Fund experience will be better than the illustrated scenario. This distinction needs to be clear in comparisons of the two sets of projections.

Tables IV.B1-IV.B4 in the *Trustees Report* provide good examples of where the presentation of less data may help non-technical audiences focus on key insights to the uncertainty of projections. For example, Table IV.B1 (see below) presents two pages of annual income rates, cost rates, and balances, and approximately half of these data outline the low- and high-cost projections for each of

these measures. Many readers will find these data useful and experts may detect important patterns at a glance. However, many readers may avoid the data if they are not aware of the insights to be gained or choose not to spend time on analysis. Graphic representations, such as Figure IV.B1 on page 57 of the 2015 *Trustees Report* (see below), provide one means of condensing the data in these tables and making important insights more accessible. Tables 15 and 16 (below) offer another option for summarizing the data. Using the data from Table IV.B1 as an example, Tables 15 and 16 concisely describe the breadth and likelihood of variations from the intermediate projections. They also provide quick insight to how the long-range trend in cost rates and income rates changes under alternative projections of future experience.

## Summary

The 2015 Technical Panel makes these recommendations with the intent of helping public understanding of the uncertainty around projections of Social Security's finances and perhaps reaching a broader audience. The Technical Panel's recommendations aim to make information about the uncertainty more accessible by reducing the potential for confusion, illustrating more plausible projections, and highlighting key information in the body of the report. As the likelihood of significant changes to the Social Security program increases, so does the importance of accessible, understandable information about how the program is affected by uncertain outcomes.

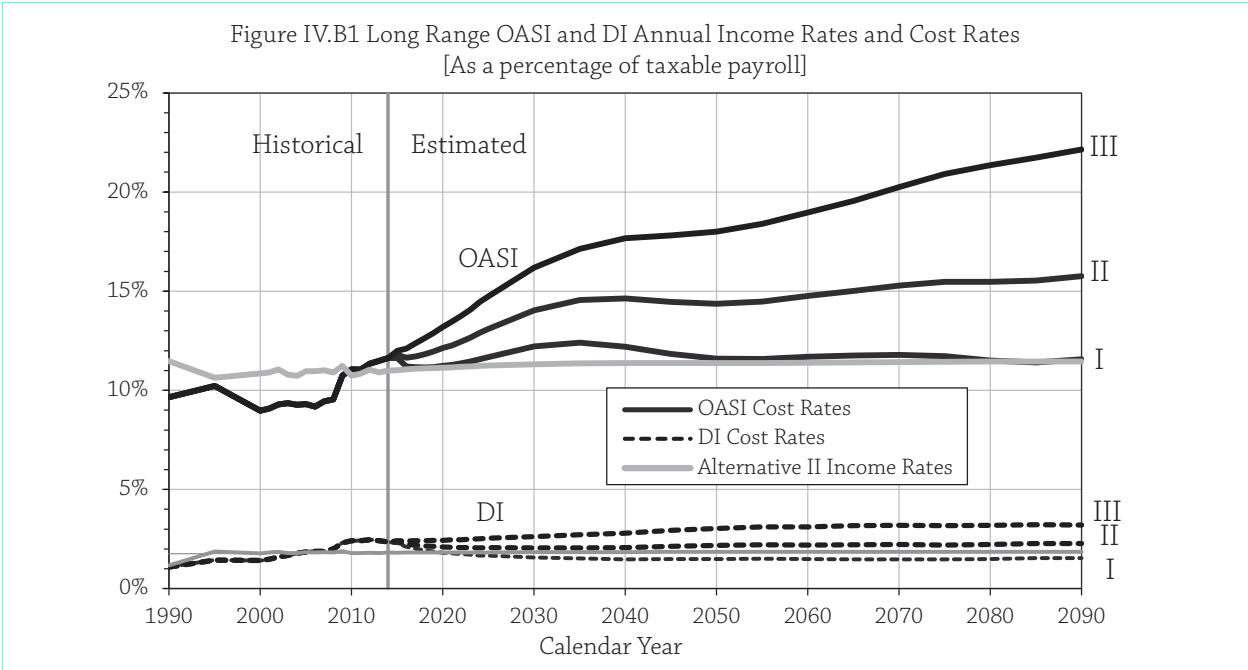
Exhibit: Trustees Report Table IV.B1

Table IV.B1.—Annual Income Rates, Cost Rates, and Balances, Calendar Years 1990-2090 [As a percentage of taxable payroll]									
Calendar year	OASI			DI			OASDI		
	Income rate <sup>a</sup>	Cost rate	Balance	Income rate <sup>a</sup>	Cost rate	Balance	Income rate <sup>a</sup>	Cost rate	Balance
<b>Historical data:</b>									
1990.....	11.47	9.66	1.82	1.18	1.09	0.10	12.66	10.74	1.91
1995.....	10.64	10.22	.42	1.87	1.44	.43	12.51	11.67	.85
2000.....	10.85	8.98	1.87	1.78	1.42	.36	12.62	10.40	2.23
2001.....	10.90	9.08	1.82	1.82	1.48	.35	12.72	10.56	2.17
2002.....	11.06	9.29	1.76	1.85	1.60	.24	12.90	10.89	2.01
2003.....	10.79	9.35	1.44	1.80	1.68	.12	12.59	11.03	1.56
2004.....	10.73	9.27	1.46	1.79	1.78	.02	12.53	11.05	1.48
2005.....	10.96	9.31	1.65	1.84	1.85	-.02	12.80	11.16	1.63
2006.....	10.96	9.18	1.78	1.83	1.88	-.05	12.79	11.06	1.73
2007.....	11.01	9.44	1.57	1.84	1.88	-.04	12.85	11.32	1.53
2008.....	10.90	9.54	1.37	1.83	2.01	-.19	12.73	11.55	1.18
2009.....	11.23	10.74	.30	1.88	2.31	-.43	13.11	13.05	.06
2010.....	10.75	11.06	-.30	1.79	2.41	-.62	12.55	13.47	-.92
2011.....	10.84	11.05	-.21	1.80	2.42	-.62	12.64	13.47	-.83
2012.....	11.05	11.35	-.30	1.81	2.47	-.66	12.85	13.81	-.96
2013.....	10.91	11.49	-.57	1.80	2.42	-.62	12.71	13.91	-1.20
2014.....	10.99	11.63	-.64	1.82	2.36	-.55	12.80	13.99	-1.19
<b>Intermediate:</b>									
2015.....	11.01	11.79	-.77	1.81	2.34	-.54	12.82	14.13	-1.31
2016.....	11.06	11.64	-.58	1.82	2.25	-.42	12.88	13.88	-1.00
2017.....	11.09	11.71	-.62	1.82	2.19	-.37	12.91	13.89	-.98
2018.....	11.11	11.82	-.71	1.83	2.15	-.33	12.94	13.97	-1.03
2019.....	11.13	11.96	-.84	1.83	2.13	-.30	12.95	14.09	-1.14
2020.....	11.14	12.13	-.99	1.83	2.10	-.27	12.96	14.23	-1.26
2021.....	11.16	12.26	-1.11	1.83	2.08	-.25	12.98	14.35	-1.36
2022.....	11.18	12.45	-1.26	1.83	2.07	-.24	13.01	14.52	-1.51
2023.....	11.20	12.66	-1.46	1.83	2.07	-.24	13.03	14.72	-1.69
2024.....	11.23	12.90	-1.67	1.83	2.06	-.23	13.06	14.96	-1.89
2025.....	11.25	13.10	-1.85	1.83	2.07	-.24	13.08	15.16	-2.08
2030.....	11.32	14.04	-2.73	1.84	2.05	-.21	13.15	16.10	-2.94
2035.....	11.36	14.56	-3.20	1.84	2.06	-.22	13.20	16.62	-3.42
2040.....	11.37	14.64	-3.27	1.84	2.07	-.23	13.21	16.71	-3.50
2045.....	11.37	14.46	-3.09	1.85	2.14	-.29	13.22	16.60	-3.38
2050.....	11.37	14.36	-3.00	1.85	2.18	-.33	13.22	16.54	-3.32
2055.....	11.38	14.48	-3.10	1.85	2.21	-.36	13.23	16.69	-3.45
2060.....	11.40	14.76	-3.36	1.85	2.20	-.34	13.25	16.95	-3.70
2065.....	11.41	15.01	-3.59	1.86	2.21	-.36	13.27	17.22	-3.95
2070.....	11.43	15.29	-3.85	1.86	2.22	-.36	13.29	17.50	-4.21
2075.....	11.44	15.48	-4.04	1.86	2.20	-.34	13.30	17.68	-4.38
2080.....	11.45	15.48	-4.03	1.86	2.23	-.38	13.30	17.71	-4.41
2085.....	11.45	15.53	-4.08	1.86	2.28	-.42	13.31	17.81	-4.50
2090.....	11.46	15.75	-4.28	1.86	2.27	-.41	13.32	18.01	-4.69
First year balance becomes negative and remains negative throughout the projection period.									
					2010.....			2005.....	
<b>Low-cost:</b>									
2015.....	10.96	11.63	-.67	1.80	2.28	-.48	12.75	13.90	-1.15
2016.....	11.07	11.21	-.14	1.83	2.11	-.28	12.90	13.32	-.42
2017.....	11.06	11.17	-.11	1.82	2.01	-.19	12.88	13.18	-.30
2018.....	11.07	11.15	-.07	1.82	1.93	-.11	12.89	13.08	-.18
2019.....	11.08	11.17	-.09	1.82	1.87	-.05	12.90	13.04	-.13
2020.....	11.09	11.24	-.15	1.82	1.81	-.01	12.91	13.05	-.14
2021.....	11.10	11.28	-.18	1.82	1.77	.05	12.92	13.06	-.13
2022.....	11.12	11.36	-.24	1.82	1.74	.08	12.95	13.10	-.16
2023.....	11.14	11.45	-.32	1.82	1.71	.12	12.96	13.16	-.20
2024.....	11.16	11.56	-.41	1.82	1.67	.15	12.98	13.24	-.26

Table IV.B1.—Annual Income Rates, Cost Rates, and Balances, Calendar Years 1990-2090 (Cont.) [As a percentage of taxable payroll]									
Calendar year	OASI			DI			OASDI		
	Income rate <sup>a</sup>	Cost rate	Balance	Income rate <sup>a</sup>	Cost rate	Balance	Income rate <sup>a</sup>	Cost rate	Balance
<b>Low-cost (Cont.):</b>									
2025.....	11.17	11.68	-.51	1.83	1.66	0.16	13.00	13.35	-.35
2030.....	11.22	12.22	-1.00	1.83	1.57	.26	13.05	13.79	-.74
2035.....	11.24	12.40	-1.16	1.83	1.52	.31	13.07	13.91	-.84
2040.....	11.24	12.20	-.96	1.83	1.48	.35	13.07	13.68	-.61
2045.....	11.22	11.83	-.61	1.83	1.50	.33	13.06	13.33	-.27
2050.....	11.22	11.60	-.38	1.83	1.50	.33	13.05	13.10	-.05
2055.....	11.22	11.58	-.37	1.84	1.51	.33	13.05	13.09	-.04
2060.....	11.23	11.69	-.47	1.84	1.49	.35	13.06	13.18	-.12
2065.....	11.23	11.75	-.52	1.84	1.48	.35	13.07	13.23	-.17
2070.....	11.23	11.78	-.55	1.84	1.48	.36	13.07	13.26	-.20
2075.....	11.23	11.72	-.49	1.84	1.47	.37	13.06	13.19	-.12
2080.....	11.22	11.50	-.28	1.84	1.50	.34	13.05	12.99	.06
2085.....	11.21	11.41	-.20	1.84	1.54	.30	13.05	12.95	.10
2090.....	11.22	11.57	-.34	1.84	1.54	.30	13.06	13.10	-.05
First year balance becomes negative and remains negative throughout the projection period.									
					2010.....			b.....	
<b>High-cost:</b>									
2015.....	11.08	11.99	-.90	1.82	2.42	-.60	12.90	14.41	-1.50
2016.....	11.03	12.11	-1.09	1.81	2.40	-.59	12.84	14.52	-1.67
2017.....	11.13	12.37	-1.25	1.83	2.41	-.58	12.95	14.78	-1.83
2018.....	11.16	12.63	-1.47	1.83	2.42	-.59	12.99	15.04	-2.06
2019.....	11.18	12.90	-1.72	1.83	2.43	-.60	13.01	15.33	-2.32
2020.....	11.20	13.20	-2.00	1.83	2.44	-.61	13.03	15.64	-2.61
2021.....	11.22	13.46	-2.24	1.83	2.46	-.62	13.06	15.91	-2.86
2022.....	11.25	13.75	-2.49	1.84	2.47	-.64	13.09	16.22	-3.13
2023.....	11.28	14.06	-2.79	1.84	2.49	-.65	13.12	16.56	-3.44
2024.....	11.32	14.45	-3.13	1.84	2.51	-.67	13.16	16.97	-3.81
2025.....	11.34	14.74	-3.40	1.84	2.55	-.71	13.18	17.29	-4.11
2030.....	11.43	16.18	-4.76	1.85	2.63	-.78	13.28	18.82	-5.54
2035.....	11.49	17.14	-5.65	1.85	2.72	-.87	13.34	19.87	-6.52
2040.....	11.53	17.67	-6.14	1.86	2.80	-.94	13.39	20.47	-7.08
2045.....	11.55	17.82	-6.28	1.86	2.94	-1.08	13.41	20.76	-7.35
2050.....	11.56	18.01	-6.45	1.87	3.03	-1.16	13.43	21.04	-7.61
2055.....	11.59	18.40	-6.81	1.87	3.11	-1.24	13.46	21.51	-8.05
2060.....	11.63	18.97	-7.34	1.87	3.12	-1.25	13.50	22.09	-8.59
2065.....	11.66	19.56	-7.89	1.88	3.17	-1.29	13.54	22.72	-9.18
2070.....	11.71	20.25	-8.55	1.88	3.19	-1.31	13.59	23.45	-9.86
2075.....	11.75	20.92	-9.17	1.88	3.17	-1.29	13.63	24.09	-10.46
2080.....	11.77	21.35	-9.57	1.88	3.20	-1.32	13.65	24.54	-10.89
2085.....	11.80	21.73	-9.93	1.88	3.23	-1.35	13.68	24.96	-11.28
2090.....	11.82	22.14	-10.32	1.88	3.21	-1.32	13.70	25.35	-11.64
First year balance becomes negative and remains negative throughout the projection period.									
					2010.....			2005.....	
<sup>a</sup> Income rates include certain reimbursements from the General Fund of the Treasury. <sup>b</sup> The Trustees project the annual balance to be negative for a temporary period and return to positive levels before the end of the projection period. Notes: 1. The income rate excludes interest income. 2. Revisions of taxable payroll may change some historical values. 3. Totals do not necessarily equal the sums of rounded components.									

Source: 2015 Trustees Report.

Exhibit: Trustees Report Figure IV.B1



Source: 2015 Trustees Report.

Table 15. Annual Income Rates, Cost Rates, and Balances—Summary Data from Higher Trust Fund Balance and Lower Trust Fund Balance Projections, OASI and DI (as a Percent of Taxable Payroll)

	OASI			DI			OASDI		
	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance	Income rate	Cost rate	Balance
Intermediate									
2090	11.46%	15.75%	-4.28%	1.86%	2.27%	-0.41%	13.32%	18.01%	-4.69%
Higher Balance									
2090	11.22%	11.57%	-0.34%	1.84%	1.54%	0.30%	13.06%	13.10%	-0.05%
Difference from intermediate	-0.24%	-4.18%	3.94%	-0.02%	-0.73%	0.71%	-0.26%	-4.91%	4.64%
2041–2090 Trend	Increasing			Decreasing			Increasing		
Lower Balance									
2090	11.82%	22.14%	-10.32%	1.88%	3.21%	-1.32%	13.70%	25.35%	-11.64%
Difference from intermediate	0.36%	6.39%	-6.04%	0.02%	0.94%	-0.91%	0.38%	7.34%	-6.95%
2041–2090 Trend	Decreasing			Decreasing			Decreasing		

Source: Technical Panel example.

Table 16. Annual Income Rates, Cost Rates, and Balances—Summary Stochastic Data, OASDI (as a Percent of Taxable Payroll)

	Income rates	Cost rates	Annual balances
<b>Intermediate</b>			
2090	13.32%	18.01%	-4.69%
<b>10<sup>th</sup> percentile</b>			
2090	13.17%	15.23%	-9.04%
Difference from intermediate	-0.15%	-2.78%	-4.35%
<b>90<sup>th</sup> percentile</b>			
2090	13.58%	22.61%	-2.06%
Difference from intermediate	0.26%	4.60%	2.63%
Percent of scenarios with declining balance 2041–2090	72%		

Source: Technical Panel example.

## ■ 3.2 Illustrating Scheduled Benefits Relative to Earnings

From 1989 to 2000, Social Security reported benefits as a percentage of final earnings for three types of “steady earners.” Low, medium and high earners were assumed to earn 45 percent, 100 percent, and 160 percent respectively of the Average Wage Index (AWI) in each year, and benefits were illustrated relative to the final year of these steady earnings. With earnings tracking AWI, this ratio was equivalent to using wage-indexed career-average earnings as the denominator.

From 2002–2013,<sup>91</sup> the Trustees reported projected benefits as a percentage of career-average earnings, indexed by national wage growth to the year prior to retirement, for “scaled earners.” Scaled earners have earnings patterns that, instead of assuming steady and continuous growth, are more representative of actual earnings patterns.

The 2014 and 2015 *Trustees Reports* did not provide any measure of benefits as a percentage of earnings. Instead, they show scheduled benefit amounts upon retirement at the full retirement age (FRA) and at age 65, calculated under intermediate assumptions for various hypothetical scaled earners attaining age 65 in 2014/2015 and subsequent years (see table V.C7 in the 2014 and 2015 *Trustees Reports*). Table V.C7 also shows the National Average Wage Index in constant dollars (in the year of the published Report) from which it is possible to compute some of the percentage-of-earnings measures provided in prior reports.

**Presentation Recommendation.** The Technical Panel recommends the *Trustees Report* provide information on the relationships between benefits and earnings for three purposes. First, these ratios indicate an effect of changes to the benefit formula on the history of the program and the projection of its financial status. Second, measured on a lifetime basis, these ratios show the impact of improving mortality on the cost of individual benefits. Third, these ratios provide insights to workers, employers and policymakers about the role of Social Security benefits in individuals’ financial planning or employers’ retirement plan design. To meet these needs, the Panel recommends the following tables:

1. Reporting the relationship between initial benefits and AIMEs for various combinations of claiming age and age for full benefits.
2. Reporting the relationship between lifetime benefits and lifetime earnings.
3. Reporting the relationship between initial benefits and late-career earnings (replacement rates) for actual and hypothetical workers.
4. Supplementing the calculations for workers with calculations for families, taking into account both worker and family benefits relative to the earnings of the family.
5. Providing supplemental information on the role of survivor benefits.

**Method Recommendation.** The Technical Panel recommends that OCACT undertake research for several purposes, including: 1) to help inform some of the measures that we recommend be included in the *Trustees Report*; 2) to show benefits relative to earnings for a sample of actual workers, following up the work in the 2014 Actuarial Note 155 entitled “Replacement Rates for Retirees: What Makes Sense for Planning and Evaluation;” and 3) to show ratios involving auxiliary benefits.

### The Relationship between Initial Benefits and AIME

Reporting initial benefit levels relative to AIME, for a matrix of claiming ages and ages for full benefits, helps understanding of the impact of existing legislation and individual decision-making on financial projections of Social Security. Following precedent, the focus is on individual worker benefits and earnings histories. Survivor and spousal benefits, which together comprise 20 percent of total OASI benefit expenditures, are discussed below.

The Panel recommends two separate tables. The first (Table 17) reports the effect of actuarial adjustments on early and delayed claiming and how it varies with changes in the FRA. These effects are represented as a percentage of the Primary Insurance Amount (PIA) that the individual would receive. As the adjustment is the same for all retirees with the same birth year, a single table provides the information.

Tables 18A–18C move from percentages of PIA to percentages of AIME for scaled workers with different AIME levels. Note that for individuals claiming benefits at the Full Retirement Age, this measure is simply the ratio of PIA/AIME. For other claiming age and FRA combinations, the ratios will incorporate the adjustments from Table 17.

<sup>91</sup> The table was not published in the 2001 Trustees Report while the shift in methodology from steady to scaled earners was being implemented. The relevant data are available electronically for 2001. See <http://www.ssa.gov/OCACT/TR/TR01/IrIndex.html> (bottom of page).



Table 17. Scheduled Monthly Benefit, as a Percentage of the Primary Insurance Amount, at Various Claiming Ages for Different Full Retirement Ages (FRAs), Cohorts born in 1937 and Later

	FRA = 65	FRA = 66	FRA = 67
Claim Age = 62	80.0%	75.0%	70.0%
Claim Age = 63.75	91.7%	85.0%	78.8%
Claim Age = 65	100.0%	93.3%	86.7%
Claim Age = 66	106.5%	100.0%	93.3%
Claim Age = 67	113.0%	108.0%	100.0%
Claim Age = 70	132.5%	132.0%	124.0%

Note: The increase in monthly benefits at ages after 65 for those whose normal retirement age was 65 (known as “delayed retirement credits”) are based on the actual increments available for those born in 1937 (6.5 percent) the last year the NRA was 65. The DRC increments increased from 3 percent per year for those born in 1924 by 0.5 percent every two years starting with those born in 1925–26 until they reached 8 percent for those born in 1943 and later when the NRA had reached age 66.

Source: This table is a simplified version of the one currently available at: [http://www.ssa.gov/oact/ProgData/ar\\_drc.html](http://www.ssa.gov/oact/ProgData/ar_drc.html).

Table 18A-18C. Monthly Retired Worker Benefit (excluding COLAs), as a Percentage of Average Indexed Monthly Earnings (AIME), at Various Claiming Ages for Different Full Retirement Ages (FRAs)

A. Scaled low earner			
	FRA = 65	FRA = 66	FRA = 67
Claim Age = 62	47%	44%	41%
Claim Age = 63.75	53%	50%	46%
Claim Age = 65	58%	54%	51%
Claim Age = 66	63%	58%	54%
Claim Age = 67	73%	63%	58%
Claim Age = 70	82%	77%	72%
B. Scaled medium earner			
	FRA = 65	FRA = 66	FRA = 67
Claim Age = 62	35%	33%	31%
Claim Age = 63.75	40%	37%	35%
Claim Age = 65	44%	41%	38%
Claim Age = 66	47%	44%	41%
Claim Age = 67	55%	47%	44%
Claim Age = 70	61%	58%	54%
C. Scaled high earner			
	FRA = 65	FRA = 66	FRA = 67
Claim Age = 62	28%	27%	25%
Claim Age = 63.75	33%	30%	28%
Claim Age = 65	35%	33%	31%
Claim Age = 66	38%	35%	33%
Claim Age = 67	44%	38%	35%
Claim Age = 70	50%	47%	44%

Note: Earnings used to calculate the Average Indexed Monthly Earnings (AIME) are average-wage indexed to age 60. The monthly benefit amount is CPI-indexed to age 62.

Source: Technical Panel recommended table. Calculations provided by the Office of the Chief Actuary, Social Security Administration, based on the 2015 Trustees Report.



Table 19. The Expected Present Discounted Value of Scheduled Lifetime Retired Worker Benefits, as a Percentage of Average Indexed Monthly Earnings (AIME) Relative to 1950 Birth Year

Scaled medium earner, claiming at age 65

Birth year	Year attain 65	Full retirement age	Life expectancy at 65*	Lifetime benefits as percentage of AIME**
1920	1985	65.0	17.37	70%
1930	1995	65.0	18.40	81%
1940	2005	65.5	19.62	95%
1950	2015	66.0	20.50	100%
1957	2022	66.5	20.97	91%
1960	2025	67.0	21.15	85%
1975	2050	67.0	21.99	86%
1995	2065	67.0	23.00	89%
2015	2080	67.0	23.91	92%

Note: \*Unisex cohort life expectancy \*\* Expected present discounted value of scheduled lifetime benefits, as a percentage of AIME (benefits are discounted by the Trustees assumed interest rates). The ratios are reported relative to the cohort turning 65 in 2015.

Source: Technical Panel recommended table. Calculations provided by the Office of the Chief Actuary, Social Security Administration, based on the 2015 Trustees Report.

These tables illustrate several key features of the OASI benefit calculation. First, they show the effect on annual benefits of early versus late claiming. Second, they show the effect of a rising FRA on benefit levels for a fixed claiming age. Third, a comparison among the three tables reveals the progressivity of the benefit formula by showing higher ratios of initial benefits to AIME for lower earning workers.

### The Relationship between the Cost of Lifetime Benefits and AIME

Two partially offsetting factors have affected and will affect the cost of the program—the past and scheduled increases in the FRA and the past and projected increases in life expectancy. Changes to the FRA were motivated, in part, by the expectation that beneficiaries would be

living longer. To capture the offsetting impact of these two factors, the Panel recommends an additional set of tables based on the expected present discounted value of *lifetime* worker benefits divided by AIME for a scaled medium worker who has survived to the age of claiming. Since the particular numbers in the ratio do not seem informative, Table 19 uses an index with the ratio for current retirees as the denominator for the index. This measure reflects the format in the benefit-AIME table above, recognizing that individuals subject to different ages for full benefits have different birth years. As a present discounted value reflecting cost, the discount rate is the realized real interest rate on the bonds held in the Trust Fund. Changes in the history and projection of this rate also affect the ratios.

## The Relationship between Initial Benefits and Late-In-Life Earnings (A Replacement Rate)

Information about benefits relative to earnings in the *Trustees Report* is sometimes used by private sector firms, reporters, financial advisers, and individuals as a guide for thinking about benefit adequacy or generosity. The Panel believes that the *Trustees Report* is a natural place to include measures designed for this purpose, because it has much broader reach than other OCACT documents, such as Actuarial Notes.

The Panel believes, as do many other commentators, that most individuals engaged in financial planning tend to think of Social Security replacing “near retirement” earnings, rather than lifetime earnings. Thus, it is natural to provide information about how initial Social Security benefits compare to, say, the average of real earnings in the five years prior to retirement. Older workers know their recent earnings history with some precision and slightly younger workers may have reasonably well-formed expectations, whereas most would struggle to estimate their wage-, price- or interest-factor-indexed lifetime earnings.

Even this relatively simple measure, however, requires decisions about implementation. One issue is the large variance associated with selecting a single year’s earnings. Averaging over a few years lowers the variance (and we have simply followed standard practice in choosing five, without analysis of a best choice). On the other hand, the further back one goes from the end of work, the less informative the observation. Virtually all participants in debates about replacement rates agree that the final year of earnings should not be included in the average, because many individuals will work only part of the year,

thus understating pre-retirement income. Similarly, as some workers cut back work effort and others stop work prior to claiming benefits, near-retirement earnings for full-career workers should not include zero-earnings years.<sup>92</sup> The calculation should use the same number of years for all individuals, going back to earlier years as needed.<sup>93</sup> The Panel suggests these final years of earnings be inflation-indexed; given the relatively short time horizon for the calculation, the choice of a price index rather than a wage index should make little difference.

Another issue is that such a replacement rate has very different meanings, and thus different uses, for long-career and incomplete-career workers. For the *Trustees Report*, the ratio should be reported in two ways. One way is for a set of hypothetical scaled workers. By construction, these hypothetical scaled workers are assumed to have full careers. The second way to report is to use the distribution of actual earnings, reporting averages of replacement rates over different levels of lifetime average earnings (see Tables 20A-G), which would have a similar structure to a table based on hypothetical earnings paths.<sup>94</sup> The reported tables are calculated for hypothetical workers, while the Panel hopes that calculations using actual histories will be done in the future. For a calculation based on actual histories, we suggest that the analysis be considered only for long-career workers, using a cutoff that will be informed by examining the pattern of careers. As many short-career workers are part of a family with a long-career worker, the role of their benefits (as well as family benefits) will be part of the consideration of family benefits relative to family earnings discussed below.<sup>95</sup>

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92 Moreover, years with earnings below some threshold should not be used. Actuarial Note 155 uses \$100 as the cutoff; the Panel thinks it would be more informative to use an individual-specific cutoff, such as a percentage of AIME or some other measure of long-career earnings.

93 Perhaps a cutoff on the number of years required should be established for inclusion in the sample, although this problem will be substantially mitigated by the focus on full-career workers.

94 Having limited the sample to long-career workers, these workers could be divided into quintiles of lifetime earnings. Then the average replacement rate could be calculated for each quintile of the lifetime earnings distribution.

95 We recognize that this does not exhaust the set of short-career workers, and suggest analysis identifying histories that warrant a separate analysis.

Table 20A. Annual Initial Benefit at Age 62 as a Percentage of Average Annual Earnings over the Last Five Years of Positive Earnings, prior to Age 62 (CPI indexed up to age 61), for the cohort turning 62 in the year of the current Trustees Report

A: Cohort turning age 62 in 2015

Percentile of AIME	Annual benefit (a)	Average of last five full years of positive earnings (b)	Replacement rate (a)/(b)
10	\$6,130	\$11,129	55%
30	\$9,670	\$27,356	35%
50	\$13,161	\$45,165	29%
70	\$17,150	\$65,515	26%
90	\$20,936	\$98,048	21%

Table 20B-G. Annual Initial Benefit at Age 62 as a Percentage of Average Annual Earnings over the Last Five Years of Positive Earnings, prior to Age 62 (CPI indexed up to age 61) for the Cohort Turning Age 62 10 Years before and 10 to 50 Years after the Cohort Used as the Basis for Table 20A

B: Cohort turning age 62 in 2005

Percentile of AIME	Annual benefit (a)	Average of last five full years of positive earnings (b)	Replacement rate (a)/(b)
10	\$4,649	\$8,575	54%
30	\$7,342	\$21,079	35%
50	\$9,991	\$34,801	29%
70	\$13,018	\$50,481	26%
90	\$15,811	\$75,549	21%

(Tables 20C–20F are not shown here)

G: Cohort turning age 62 in 2065

Percentile of AIME	Annual benefit (a)	Average of last five full years of positive earnings (b)	Replacement rate (a)/(b)
10	\$40,468	\$78,650	51%
30	\$63,815	\$193,328	33%
50	\$86,840	\$319,185	27%
70	\$113,153	\$463,002	24%
90	\$138,133	\$692,917	20%

Note: Earnings levels for the last 5 years with positive earnings in these tables are based on the scaled earnings profile adjusted to exclude years with no earnings. The scaled earnings profile is based on actual earnings of a 1% sample of workers from 1992 through 2011.

Source: Technical Panel recommended table. Calculations provided by the Office of the Chief Actuary, Social Security Administration, based on the 2015 Trustees Report.

The Panel recognizes that OCACT would have to invest significant resources in cleaning the data for the calculations based on the actual earnings distributions. Measures like these, however, are important enough to the public that resources should be made available to update them annually. However, if resource constraints are binding, the Panel would encourage the Trustees to report these measures annually but only update every 3–5 years or whenever a substantial policy change would significantly alter the conclusions. Extrapolated measures could be used in intervening years.

### Additional Considerations

The tables suggested above are all measures of individual worker earnings and benefits. The Panel believes that two additional measures would be highly informative and important.

#### Family Benefits

The Panel believes that the reported measures on an individual basis should be supplemented with additional measures on a family basis to reflect spousal, child, and other ancillary benefits as well as worker benefits for both members of a couple. Both hypothetical examples and population sampled data could be used to provide additional information for each of these cases described above.

#### Survivor Benefits

A related but distinct issue is providing information about benefits to the surviving member of a couple after the death of a spouse. That is, when one member of a couple dies, it would be useful to report on the relationship between the benefit for the survivor and the benefits that had been received by the couple. This ratio varies with the makeup of the earnings history of the couple and their dates of birth. Because this information is important for the welfare of the population, and particularly the poverty rate of the elderly, the Panel thinks it should be calculated and presented. Moreover, such information would be helpful for the repeated discussions of changing the calculation of survivor benefits.

## ■ 3.3 Measures of Long-Run Financial Sustainability

**Presentation Recommendation 1.** The Technical Panel recommends enhancing the discussion of very long-run financial sustainability through: 1) reporting the cost-revenue gap in the 75<sup>th</sup> year in proportion to revenue and GDP; 2) reporting whether this gap is increasing, stable or decreasing; 3) explicitly discussing the financial consequences of any program features that are not expected to fully emerge during the 75-year valuation period; and 4) providing a more extensive discussion of sustainable solvency than is currently included in the *Trustees Reports*.

**Presentation Recommendation 2.** At the same time that the above changes are made, the Technical Panel recommends eliminating the infinite horizon metric from the *Trustees Report*.

Although not related to the *Trustees Report* itself, the Technical Panel also recommends that, when evaluating proposed reforms to the Social Security program, OCACT include an analysis of the effect on the present value of changes in revenues minus the present value of changes in benefits for the expected lifetime of several cohorts.

### Infinite Horizon Measures

Evaluating the financial sustainability of the Social Security system requires a time period for valuations. Social Security has long used a 75-year valuation period. Since 2003, all *Trustees Reports* have also included summary statistics from calculations made using an infinite horizon. The 2015 *Trustees Report* includes a separate chapter, F, entitled “Infinite Horizon Projections,” which focuses on the present value of the unfunded obligation of OASDI over the indefinite future, both in current dollar terms and in proportion to taxable payroll and to GDP. These calculations take estimated demographic and economic trends at the end of the 75-year period and extrapolate them forward. The results are accompanied by the statement: “Of course, the degree of uncertainty associated with estimates increases substantially for years further in the future.”

To determine the value of the infinite horizon calculations, the Technical Panel first assessed the underlying concerns that such calculations were intended to satisfy. These include:

1. To reduce concern about possible shifts in revenues or costs past the 75-year projection period, resulting from program features or assumptions whose effects do not fully emerge over the 75-year projection period.
2. To provide a quantitative metric (ratio of the unfunded liability to taxable payroll and GDP) of the program's very long-term sustainable solvency.
3. To provide a quantitative basis to assess policy changes whose revenue or cost effects take more than 75 years to unfold.

## Past Technical Panels

The last three Technical Panels have presented a wide range of views regarding the infinite horizon calculations.

- The 2003 Technical Panel endorsed projecting the trust funds' status into the infinite horizon. The Panel argued that very long-term projections can provide additional information beyond that in the 75-year calculations, as some reform proposals might take longer than 75 years to phase in. The Panel noted that further study of projection techniques past 75 years would be important, as simpler modeling of projections over the very long-term period may be appropriate.
- The 2007 Technical Panel found that for analysis of the trust funds, the disadvantages of very long-range forecasts outweigh their advantages. In fact, they recommended that more attention be paid to the first 25 years of any forecast, as the 2007 Technical Panel believed that it is more important to focus on what is reasonably "knowable" than on the part of the future that is highly speculative. They pointed out that relatively small changes in assumptions can lead to exaggerated effects on the projection, especially over the long term.
- The 2011 Technical Panel recommended an expansion of the discussion of sustainable solvency. If the discussion was expanded, then the 2011 Technical Panel recommended eliminating the infinite horizon information from the *Trustees Report*. The reasons the Panel gave were: 1) it requires projections hundreds of years into the future, with no information provided regarding the huge uncertainties associated with estimates for this period, although if expressed as a percent of GDP this concern is reduced; and 2) the

infinite horizon deficit had sometimes been quoted in policy discussions without including its relation to corresponding GDP, which is both misleading and shifts the focus from more useful metrics.

## Concerns with the Infinite Horizon Calculations

In addition to concerns raised by the previous two Technical Panels, many commentators have expressed concern regarding the assumptions necessary for infinite horizon calculations, as well as their uncertainty and presentation in the *Trustees Reports*.

### Uncertainty

The primary concern involves the extent of uncertainty in projections that increase with the length of the projection horizon. It is difficult to imagine conditions or trends more than 75 years in the future; the changes over a historical period longer than 75 years will always be enormous. Any confidence interval around a projection extending into the infinite future would have to be so large as to make even a central projection unhelpful as a guide to policymaking. As discussed elsewhere in this report, it is difficult to effectively quantify and illustrate uncertainty over any period of time, with the challenges only growing at longer durations. Showing central estimates this long into the future without applicable caveats regarding its uncertainty provides an incomplete story.

### Presentation

It is difficult to frame infinite horizon numbers, whether very large positive or negative, in a manner that makes them meaningful or useful to policymakers or the public. This would especially be true if the growth rate in annual deficits exceeded the discount rate, which would lead to an infinite horizon deficit of infinity.

## Basis for Recommendations

Given the enormous uncertainty bands at very long time horizons, the extreme sensitivities to small changes in assumptions, and the difficulties in communicating infinite horizon numbers in a manner that makes them meaningful, the 2015 Technical Panel believes that calculations to infinity (and current chapter F, *Infinite Horizon Projections*) should not be continued. However, as with the 2011 Panel, we believe this should be done if and only if the *Trustees Report* incorporates much more discussion of the long-term sustainability of the Social Security system's finances, including the items in the 2015 Panel's first recommendations above.

## ■ Chapter 1. Demographic Assumptions and Methods

### 1.1 Fertility

- Bongaarts, John and Griffith Feeney. 1998. "On the Quantum and Tempo of Fertility." *Population and Development Review* 24(2): 271–291.
- Cherlin, Andrew, Erin Cumberworth, S. Philip Morgan, and Christopher Wimer. 2013. "The Effects of the Great Recession on Family Structure and Fertility." *Annals of the American Academy of Political and Social Science* 650 (1): 214–231.
- Goldin, Claudia and Lawrence F. Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy* 110(4): 730–770.
- Max Planck Institute for Demographic Research and Vienna Institute of Demography. *The Human Fertility Database, 1917–2006*. Rostock, Germany.
- Morgan, Phillip S., Erin Cumberworth, and Christopher Wimer. 2011. "The Great Recession's Influence on Fertility, Marriage, Divorce and Cohabitation." In *The Great Recession*, edited by David B. Grusky, Bruce Wester, and Christopher Wimer, 220–245. New York, NY: Russell Sage Foundation.
- National Center for Health Statistics. 2015. "Births: Final Data for 2013." *National Vital Statistics Reports* 64(1). Washington, DC: U.S. Department of Health and Human Services.
- Rindfuss, Ronald R., John Shelton Reed, and Craig St. John. 1978. "A Fertility Reaction to a Historical Event: Southern White Birthrates and the 1954 Desegregation Ruling." *Science* 20: 178–180.
- Ryder, Norman B. 1980. "Components of Temporal Variations in American Fertility." In *Demographic Patterns in Developed Societies*, edited by Robert W. Hiroms, 15–54. London, UK: Taylor and Francis.
- Schneider, Daniel. 2015. "The Great Recession, Fertility, and Uncertainty: Evidence from the States." Unpublished working paper.

Sobotka, Tomas, Vegard Skirbekk, and Dimiter Philipov. 2011. "Economic Recession and Fertility in the Developed World." *Population and Development Review* 37(2): 267–306.

U.S. Social Security Administration, Office of the Chief Actuary. 2015. *The Long-Range Demographic Assumptions for The 2015 Trustees Report*. Washington, DC.

### 1.2 Mortality

- Bongaarts, John. 2006. "How Long Will We Live?" *Population and Development Review* 32(4): 605–628.
- Glei, Dana, Samuel Preston, and John Wilmoth. 2010. "Contribution of Smoking to International Differences in Life Expectancy." *International Differences in Mortality at Older Ages: Dimensions and Sources*, Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen, eds. Washington, DC: The National Academy Press.
- Kashin, Konstantin, Gary King, and Samir Soneji. 2015. "Systematic Bias and Non-transparency in US Social Security Administration Forecast." *Journal of Economic Perspectives* 29(2): 239–258.
- National Research Council of the National Academies. 2011. *Explaining Divergent Levels of Longevity in High-Income Countries*. Edited by Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen. Washington (DC): The National Academies Press.
- Preston, Samuel H., Dana Gleit, and John R. Wilmoth. 2010. "A New Method for Estimating Smoking-attributable Mortality in High-income Countries." *International Journal of Epidemiology* 39: 430–438.
- U.S. Social Security Administration. 2015. *The 2015 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.
- U.S. Social Security Administration, Office of the Chief Actuary. 2015. *The Long-Range Demographic Assumptions for The 2015 Trustees Report*. Washington, DC.
- U.S. Social Security Advisory Board. *Report of the Technical Panel on Assumptions and Methods*, various years. Washington, DC.



University of California, Berkeley and Max Planck Institute for Demographic Research. *Human Mortality Database*.

### 1.3 Immigration

Lowell, Lindsay B. 2014. "Managing Immigration: A Review of Some Past Projections." *Migration Letters* 11 (1): 33–42.

Lowell, Lindsay B. and Micah Bump. 2006. "Projecting Immigrant Visas: Report on an Experts Meeting." Working Paper. Washington, DC: Institute for the Study of International Migration, Georgetown University.

U.S. Census Bureau. 2009. *Methodology Statement for the 2009 National Projections*. Washington, DC.

U.S. Social Security Administration. 2015. *The 2015 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

U.S. Social Security Administration, Office of the Chief Actuary. 2013. *Effects of Unauthorized Immigration on the Actuarial Status of the Social Security Trust Funds*. Actuarial Note 151. Washington, DC.

U.S. Census Bureau. 2009. *2009 National Population Projections (Supplemental): Comparison Tables*. Washington, DC.

U.S. Census Bureau. 2014. *Methodology, Assumptions, and Input for the 2014 National Projections*. Washington, DC.

### 1.4 Disability

Autor, David, and Mark Duggan. 2003. "The Rise in the Disability Rolls and the Decline in Unemployment." *Quarterly Journal of Economics* 118(1): 157–206.

Autor, David, and Mark Duggan. 2006. "The Growth in the Social Security Disability Rolls: A Fiscal Crisis Unfolding." Working Paper 12436. Cambridge, MA: The National Bureau of Economic Research.

Black, Dan, Kermit Daniel, and Seth Sanders. 2002. "The Impact of Economic Conditions on Participation in Disability Programs: Evidence from the Coal Boom and Bust." *American Economic Review* 92(1): 27–50.

Duggan, Mark, and Scott A. Iberman. 2009. "Why Are the Disability Rolls Skyrocketing? The Contribution of Population Characteristics, Economic Conditions, and Program Generosity." In *Health at Older Ages: The Causes and Consequences of Declining Disability among the Elderly*, edited by David M. Cutler and David A. Wise, 337–379. Chicago, IL: University of Chicago Press.

Kearney, John. 2005/2006. "Social Security and the "D" in OASDI: The History of a Federal Program Insuring Earners Against Disability." *Social Security Bulletin* 66(3): 1–25.

Liebman, Jeffery. 2015. "Understanding the Increase in Disability Insurance Benefit Receipt in the United States." *Journal of Economic Perspectives* 29(2): 123–150.

Rupp, Kalman and Charles G. Scott. 1998. "Determinants of Duration on the Disability Rolls and Program Trends." In *Growth in Disability Benefits: Explanations and Policy Implications*, edited by Kalman Rupp and David Stapleton, 139–176. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.

U.S. Social Security Administration. 2014. *Annual Statistical Report on the Social Security Disability Insurance Program, 2013*. Publication No. 13–11826. Washington D.C.

U.S. Social Security Administration. 2001. *Annual Statistical Report on the Social Security Disability Insurance Program, 2000*. Washington D.C.

U.S. Social Security Administration, Office of the Chief Actuary. 2013. *Disabled Worker Allowance Rates: Variation Under Changing Economic Conditions*. Actuarial Note 153. Washington, DC.

U.S. Social Security Administration. 2010. *Annual Report of Continuing Disability Review, Fiscal Year 2009*. Washington, DC.

U.S. Social Security Administration. *Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*, various years. Washington, DC.

## ■ Chapter 2. Economic Assumptions and Methods

### 2.1 Labor Force Participation Rate

Bell, Felicitie C. and Miller, Michael L. 2005. *Life Tables for the United States Social Security Area 1900–2100*. Actuarial Study No. 120. Washington, DC: U.S. Social Security Administration.

Goss, Stephen C., Milton P. Glanz, and Seung An. 1985. *Economic Projections for OASDI Cost and Income Estimates, 1984*. Pub. No. 11–11541. Washington, DC: Social Security Administration, U.S. Department of Health and Human Services.

Goldin, Claudia and Lawrence F. Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy* 110(4): 730–770.



Organization for Economic Cooperation and Development (OECD). *Employment and Labour Market Statistics*. Data available online. Paris, France.

U.S. Census Bureau. *Current Population Survey, Annual Social and Economic Supplement*, Various Years. Washington, DC.

U.S. Social Security Administration, Office of the Chief Actuary. 2015. *The Long-Range Demographic Assumptions for The 2015 Trustees Report*. Washington, DC.

U.S. Social Security Administration. 2010. *The 2010 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

Yang, Eugene B. and Stephen C. Goss. 1992. *Economic Projections for OASDHI Cost and Income Estimates: 1992*. Actuarial Study No. 108. Washington, DC: Social Security Administration, U.S. Department of Health and Human Services.

## 2.2 Unemployment Rate

U.S. Social Security Administration. 2011. *The 2011 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

U.S. Social Security Administration, Office of the Chief Actuary. 2015. *The Long-Range Economic Assumptions for the 2015 Trustees Report*. Washington DC.

## 2.3 Real Earnings Growth Rate

Department of Commerce, Bureau of Economic Analysis. *National Income and Product Accounts, 1948–2014*. Washington, DC.

U.S. Social Security Administration. 2015. *The 2015 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

U.S. Social Security Administration, Office of the Chief Actuary. 2015. *The Long-Range Economic Assumptions for the 2015 Trustees Report*. Washington DC.

## 2.4 Taxable Share of Total Earnings

Piketty, Thomas and Emmanuel Saez. 2013. “Top Incomes and the Great Recession: Recent Evolutions and Policy Implications.” *IMF Economic Review* 61: 456–478.

U.S. Social Security Administration. 2015. “Annual Statistical Supplement to the Social Security Bulletin, 2014.” SSA Publication No. 13–11700. Washington, DC.

U.S. Congressional Budget Office. 2015. “The 2015 Long-Term Budget Outlook,” June. (Available at [www.cbo.gov/publication/50250](http://www.cbo.gov/publication/50250))

Whitman, Kevin and David Shoffner. 2011. “The Evolution of Social Security’s Taxable Maximum.” Policy Brief No. 2011–02. Washington, DC: U.S. Social Security Administration.

## 2.5 Inflation and Interest Rates

Abrahams, Michael, Tobias Adrian, Richard K. Crump, and Emanuel Moench. 2015. “Decomposing Real and Nominal Yield Curves.” Staff Report No. 570. New York, NY: Federal Reserve Bank of New York.

Adrian, Tobias, Richard Crump, Peter Diamond, and Rui Yu. 2015. “Discounting the Long-Run,” <http://libertystreeteconomics.newyorkfed.org/2015/08/discounting-the-long-run.html>

Andrade, Philippe, Richard K. Crump, Stefano Eusepi, and Emanuel Moench. 2014. “Fundamental Disagreement.” Staff Report 655. New York, NY: Federal Reserve Bank of New York.

Brown, Jeffrey and George Pennacchi. 2015.

Congressional Budget Office. 2014. *The 2014 Long-Term Budget Outlook*. Pub. No. 4933. Washington, DC.

Kitsul, Yuriy and Jonathan H. Wright. 2013. “The Economics of Options-Implied Inflation Probability Density Functions.” *Journal of Financial Economics* 110: 696–711.

Feldman, Ronald, Ken Heinecke, Narayana Kocherlakota, Sam Schulhofer-Wohl, and Tom Tallarini. 2015. “Market-Based Probabilities: A Tool for Policymakers.” Minneapolis, MN: Federal Reserve Bank of Minneapolis.

Fleckenstein, Matthias, Francis A. Longstaff, and Hanno Lustig. 2014. “The TIPS-Treasury Bond Puzzle.” *The Journal of The American Finance Association* 69 (5).

Haubrich, Joseph, George Pennacchi, and Peter Ritchken. 2012. *Inflation Expectations, Real Rates, and Risk Premia: Evidence from Inflation Swaps*. Oxford, UK: Oxford University Press.

Piazzesi, Monika, Juliana Salomao, and Martin Schneider. 2015. “Trend and Cycle in Bond Premia.” Working Paper 2015–3. Stanford, CA: Stanford University.

U.S. Social Security Administration, Office of the Chief Actuary. 2015. *The Long-Range Demographic Assumptions for The 2015 Trustees Report*. Washington, DC.

U.S. Social Security Administration. 2015. *The 2015 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

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U.S. Social Security Administration. 2015. *The 2015 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

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U.S. Social Security Administration. *Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*, various years. Washington, DC.

U.S. Social Security Administration, Office of the Chief Actuary. 2014. “Replacement Rates for Retirees: What Makes Sense for Planning and Evaluation.” Actuarial Note 155. Baltimore, MD.

### 3.3 Measures of Long-Run Financial Sustainability

U.S. Social Security Administration. 2015. *The 2015 Report of the Board of Trustees of the Federal Old-age and Survivors Insurance and Federal Disability Insurance Trust Fund*. Washington, DC.

U.S. Social Security Advisory Board. *Report of the Technical Panel on Assumptions and Methods*, various years. Washington, DC.

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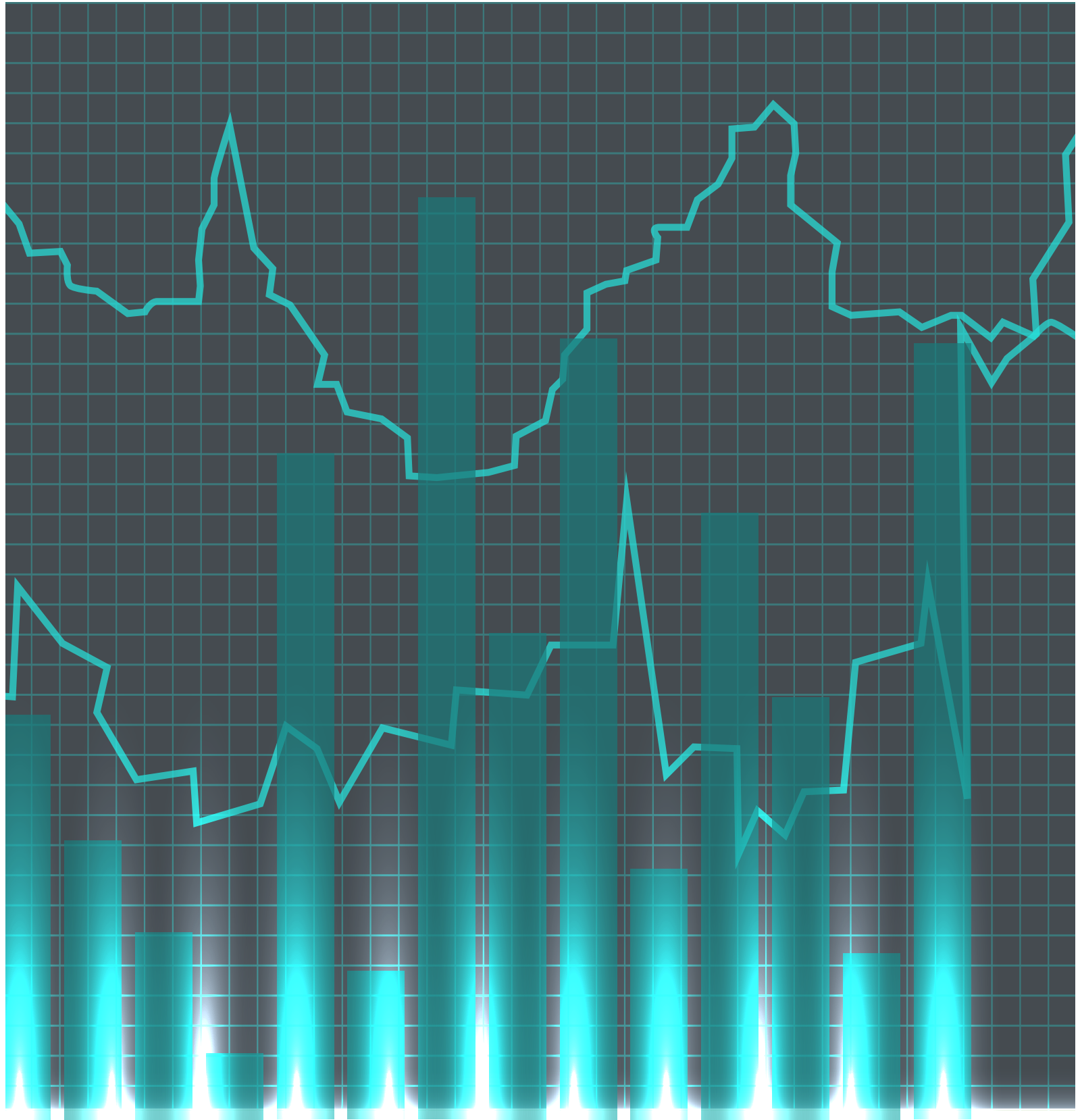
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# 2015 Technical Panel on Assumptions and Methods