Technical Panel on Labor Force Participation

Report to the

Social Security Advisory Board

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Panel Charter

Many of the forces affecting labor supply trends have been in effect for many decades and are well-understood. Others reflect emerging trends in the globalization of markets, technology, demographics and the disruption caused by the recent financial crisis and subsequent Great Recession.

Previous Technical Panels appointed by the Board and tasked to look at the full range of assumptions and methods used in the long-range projections of Social Security finances have noted the complexity of the labor force projection methodology and the need to adequately account for the turbulent forces shaping our current and future U.S. labor market. Many questions require further investigation:

- Will the upward trend in female labor force participation, which has virtually stopped growing in recent years, resume?
- Will the decades-old decline in labor force participation of prime age males continue?
- Will the growth of labor force participation of older age groups (55+) from the late 1980s until the early 2000s resume?
- Will the decline in labor force participation associated with the Great Recession prove to be temporary or permanent?
- Will the decline in cohort size associated with comparatively modest birth rates of recent years cause employers to undertake measures to induce more older workers to remain in the labor force?
- How will the currently assumed composition of future immigrants affect labor force participation rates?
- Do the current methods of projecting labor force participation adequately account for the factors most likely to affect trends in the future?

To deal adequately with the underlying complexity and the shifting economic and demographic landscape, the Board believes that a closer and more sustained look specifically at this element of the overall financial projections by an independent panel of experts is warranted. Such a Panel would consult closely with representatives of the Chief Actuary's office to fully understand the current methodology. They would confer with representatives of other government agencies who are required to make similar projections, such as the Bureau of Labor Statistics, the Council of Economic Advisers, the Congressional Budget Office. They would review the relevant recommendations of past Technical Panels and confer with other independent experts as the Panel deems necessary in person or in writing. The panel would be asked to prepare a report that would reflect any consensus views of the members. On methods or findings where consensus does not emerge, the report should present competing views with complete and detailed explanations of the sources of disagreement.

CHARTER: The Panel will evaluate the assumptions used by the Trustees and the methods employed by the Office of the Chief Actuary to project the size of the labor force and rates of labor force participation and will make recommendations on how best to improve those assumptions and methods. The Panel members will meet in public at least three times and deliver a written report to the Board with their recommendations within 7 months of their first meeting.

Introduction and Acknowledgments

The 2016 Technical Panel on Labor Force Participation was convened by the Social Security Advisory Board (SSAB) in April 2016 to review and evaluate the module used by the Office of the Chief Actuary to project the future rate of labor force participation rates in the U.S.

The Technical Panel met on June 1, 2016 in Washington, DC at the offices of the SSAB, with three closed-doors sessions and two public sessions during the day. The Panel also met on January 17 and 18, 2017 at the same location, with two public sessions and two closed-door sessions.

The panel would like to thank the staff in the Social Security Administration's Office of the Chief Actuary for their assistance in the work of the Panel and for their presence and presentations at both Washington DC meetings of the Panel and for several email and telephone exchanges. The staff patiently explained the workings of the labor force participation model to the Panel, answered numerous questions posed by the Panel, and conducted several important exercises at the Panel's request. We thank the staff in the Office, including Robert Weathers, the OCACT Supervisory Economist, and his team, Anthony Cheng, Beth Hima, Mike Miller, Bill Piet, Drew Sawyer, Sven Sinclair, Karen Smith, and Polina Vlasenko, as well as Executive Officer Jason Schultz, Deputy Chief Actuary Karen Glenn, and Chief Actuary Steve Goss.

I would also like to thank the OCACT for comments on an initial draft of this Report.

Henry Aaron, SSAB Chair, gave the Panel important guidance and advice at several points in the lifetime of the Panel which were invaluable in its work.

The Panel would also like to thank Stephanie Aaronson of the Federal Reserve Board for her presentation on the Fed model at the Panel's June 1, 2016 meeting, and would like to thank Joshua Montes and Julie Topoleski of the Congressional Budget Office (CBO) for participating in the January 18, 2017 meeting and answering questions about the CBO model. Helpful information by conference call was provided by Robert Arnold, Jeffrey Kling, Joshua Montes, and Julie Topoleski and Michael Simpson of the CBO as well as by Stephanie Aaronson.

I would also like to thank Joel Feinleib, the Technical Panel's executive director and the Social Security Advisory Board's chief economist, in assisting the Panel in its work in every aspect and providing important insights and advice at every stage, as well as providing materials for the Panel's inspection and analysis and providing useful background on the work of past Panels. In addition, the Panel was assisted by other members of the SSAB staff, including Caitlyn Tateishi, Matthew Comey, Bethel Dejene, Anita Grant and Staff Director Claire Green.

As Chair, I would most like to thank the members of the Panel for their hard work, insights, and perceptive comments on the Actuary's model and on the general issue of trends in labor force participation rates. Their dedication to the task was exemplary and the time each of them took out of their busy schedules to work on the Panel's charter and to provide advice to the SSAB was a significant piece of public service.

I would also like to thank Katherine Abraham of the University of Maryland for several very helpful conversations on the subject matter of the Panel's work and on the labor force module in the Actuary's Office.

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.

Robert A. Moffitt, Chair

Executive Summary

The labor force module constructed by the Office of the Actuary (OCACT) is used for projections of labor force participation rates over a 75-year period into the future. Those projections, coupled with those from the rest of the Actuary's model, inform projected revenues and costs for the OASDI system and therefore projected program surpluses or shortfalls. The labor force projections in the module are an important part of the projection of Trust Fund balances.

The current labor force module in the OCACT model has been developed over many years, with careful consideration to the incorporation of major determinants of labor force participation rates (LFPRs). The module is extremely detailed, projecting LFPRs for 153 different demographic groups, with different variables affecting the LFPRs of each. The structure of the model has been thoughtfully constructed and the projection equations are conventional in form, consisting of a linear weighted sum of the different factors, common to linear statistical models. A great deal of effort has gone into the weights and coefficients in the model. The projection equations used for each group, when aggregated using projected demographic proportions for each of the 153 groups, yields a projection of the aggregate LFPR over the next 75 years.

The Panel has studied the labor force module at length and has no recommendations for changing the overall structure of the module. However, the Panel does believe that a number of improvements in the assumptions and methods in the module are possible, and that these could improve the accuracy of the LFPR projections.

One area where improvements can be made is through a study of the causes of LFPR trends prior to the Great Recession (henceforth, the "Recession"), the forces which gave rise to those trends, and whether they will continue to operate in the future. There are strong trends in the LFPRs of many demographic groups prior to the Recession, especially those for prime-age men as well as for young men and women, and the current OCACT model does not well capture those trends or contain variables representing or proxying their probable causes. Adding variables to the model which capture those trends, many of which are quite likely to continue into the future, would improve the LFPR projections. The Panel's first recommendation is therefore:

Recommendation 1. **The Office of the Actuary should put additional effort into systematically exploring the capability of its labor force projection module to explain pre-Recession historical trends, and should explicitly consider which, if any, of the forces generating recent historical trends are likely not to continue into the future.**

A second, related area where improvements could be made is to conduct separate LFPR projections for different educational groups. This issue is connected to the first one, for a leading theory of the cause of the decline in LFPRs for many demographic groups prior to the Recession is that labor demand for less-skilled workers has been falling over the long term, and that this contributed to a decline in many LFPRs. The historical evidence shows that LFPR trends have been quite different by educational level. The current OCACT model incorporates education effects on LFPRs in only a very limited way. The second recommendation of the Panel is therefore:

Recommendation 2. **The OCACT model should allow for differential trends in labor force participation by level of education and should assume that the forces underlying those trends will continue at least over the medium term. Further, consistent with Recommendation 1, the OCACT model should be modified to capture pre-Recession trends by education.**

Other forces which past research has suggested may have contributed to pre-Recession LFPR trends relate to rising rates of poor health, disability in addition to SSDI receipt, and rising incarceration rates. Incorporating these variables is also likely to improve labor force projections.

A third area of improvement concerns the treatment of the recovery of LFPRs from the Recession. The current OCACT model assumes that a recovery will take place which will take LFPRs back to levels close to, and only slightly below, the 2007 levels attained just prior to the Recession. The Panel believes that the data do not support such a strong recovery. LFPRs even 7 years after the trough of the Recession are still far below their 2007 levels and have only been rising by very modest amounts. The failure of LFPRs to rise more than they have is, further, consistent with a continuation of pre-Recession downward trends into the post-Recession period, for such a continuation implies that LFPRs will not return to their 2007 levels but will only return to lower levels consistent with a long term downward trend. This leads the Panel to the following recommendation:

Recommendation 3. **The OCACT model should greatly reduce the magnitude of its projected recovery from the Recession and should instead project that relatively little recovery will occur until the evidence suggests otherwise. The model should also construct the recovery to match the model's assumption of long-term values based on pre-Recession projected trends.**

Apart from the issue of what the LFPR will return to after its recovery from the Recession, an additional issue is that a projection must be made for what the LFPR will be over the recovery period itself. The magnitude of that effect depends upon how much a given change in the unemployment rate affects LFPRs. The current OCACT model assumes that the relationship of the LFPR to the unemployment rate is that which the experience of recessions prior to 2007 suggests. The panel believes that the evidence from the Recession should be incorporated into the OCACT's estimate of the business cycle effect and, more generally, that the experience of the Recession should be fully incorporated into the model:

Recommendation 4. **The OCACT model should incorporate data from Recession years in estimating its effect of the business cycle on the labor force participation rate.**

In addition to these four recommendations, the Panel believes that several other aspects of the model could be investigated which may also lead to improvements in its labor force projections. For example, the Panel found that the method of projecting educational composition over the 75-year projection period is failing to incorporate recent trends in high school completion and therefore trends in completed years of education. The Panel also concluded that some validation of the assumptions regarding the effect of life expectancy on LFPRs should be conducted. Another area of improvement the Panel believes worth investigation is the incorporation of applications to the DI program as well as benefit receipt. Finally, the Panel concludes that an investigation of the usefulness of SSA data on earnings might be investigated to improve the accuracy of its labor force data and therefore its projections. The current projections rely mainly on household survey responses of participation and employment, while SSA earnings records contain more reliable individual-and group-level indicators of employment status during a calendar year.

Recommendation 5. **The OCACT model should modify its projection of completed educational distributions by using educational levels experienced by those younger than 35 and using the data from more recent cohorts to make projections.**

Recommendation 6. **Some attempts to validate the 40 percent life expectancy add factor should be conducted, either by comparison to regression-based estimates or by applying the add factor to historical cohorts to assess its plausibility, or both.**

Recommendation 7. **Incorporation into the OCACT model of an effect of DI application on LFPRs above and beyond benefit receipt itself should improve the accuracy of its LFPR projections.**

Recommendation 8. **The OCACT should investigate the usefulness of data on earnings reported to the Social Security Administration to improve the accuracy of its employment data.**

The Panel also compared the LFPR projections of two other models, that of the Congressional Budget Office (CBO) and that of the Federal Reserve Board, both of which project lower future LFPRs than does the OCACT model. The Panel spent greater effort on the CBO model because it projects LFPRs 75 years into the future whereas the Federal Reserve only projects 10 years out. Revisions in the CBO projections made during the Panel's deliberations increased their projected LFPRs and have greatly narrowed their differences with OCACT projections. Because of incomplete documentation of the CBO model and because the CBO did not provide sufficient information to the Panel, the Panel is unable to determine the reasons for the remaining difference. The Federal Reserve Board projects much lower LFPRs than does the OCACT or the CBO. The differences seem to be partly driven by the treatment of the Recession years and how the drop in LFPR in those years is explained. The Panel suggests that the staff of the OCACT investigate the other recommendations made in this Report before considering modifying their model to align with the Federal Reserve Board model.

1. Background: The OCACT Labor Force Module

The labor force module in the model of the Chief Actuary is designed to project labor force participation rates (LFPRs) of the population 75 years into the future.[1] To do so, a series of projection equations specified separately for different demographic groups are specified as a function of a set of variables assumed to affect the LFPRs for each group into the future. Projections are made for each group separately and then aggregate LFPRs are calculated by applying projected demographic proportions to each of the individual group's projections.

The separate groups are defined by age, marital status, and the presence of young children. For both men and women, separate projection equations are specified by age group as well as by marital status within the prime-age range. For women, the age groups in the major child-bearing range are further disaggregated by whether a child under 6 is present, within marital status categories. The total number of groups and equations in the module is 153.

The variables assumed to affect each group's LFPR differs by group. Only one variable is assumed to affect all 153 groups—the business cycle. Life expectancy is assumed to affect LFPRs only for men over 40 and women over 50; disability prevalence is assumed to affect LFPRs only of those below age 75; education is assumed to affect the LFPRs only of men 55–74 and women 45–74; the Social Security replacement rate and earnings test are assumed to affect the LFPRs of those 62–69; the LFPR of women two years younger than men is assumed to affect the LFPR of men 60–74; a cohort trend variable up to birth year 1948 is assumed to affect the LFPRs of women 55–74; the LFPR of individuals one year younger is assumed to affect the LFPRs of men and women age 75 and older; and a time trend is assumed to affect the LFPRs of selected age groups of men and women less than age 30.

The assumed effect of each of these variables on the LFPR of a group is derived separately for each variable and not part of a single estimation process, and the method of calibration differs across variables. Some effects are estimated from regression equations on past CPS data of LFPRs on the variable in question alone. Other effects are estimated by simple tabular relationships in past data of the LFPR-variable relationship. Other effects are imputed on the basis of *a priori* assumptions.

An important variable for the model is the business cycle effect. It is obtained by a regression on historical CPS data of the quarterly LFPR for each age-gender-marital-status group on current and lagged values of the unemployment rate. The regression is estimated on data from 1981 through 2007 and therefore does not use data from the Recession.

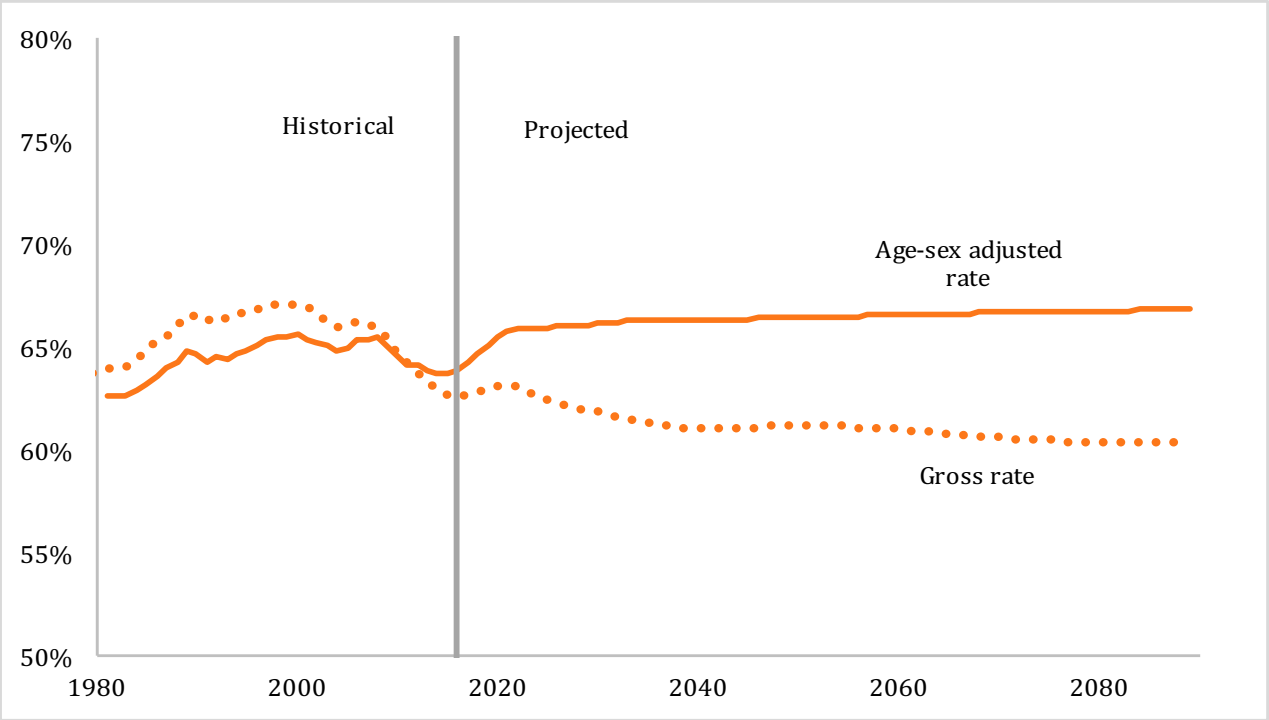
The final step in the projection is to project all the variables affecting LFPRs 75 years into the future. Most of the determining variables are assumed to stop changing after a few years, including the unemployment rate, which is assumed to level out at 5.5%. The only variables which have a non-trivial effect on long-run LFPRs are the variables for life expectancy and the disability prevalence rate. Rising life expectancy is assumed to raise aggregate LFPRs by 1.7 percentage points 75 years out, and rising disability prevalence is assumed to lower aggregate LFPRs by 0.3 percentage points 75 years out.

The projected LFPRs in each year for each of the 153 groups are then weighted by projected demographic proportions in each year to obtain an aggregate projection.

The aggregate LFPR projection in the 2016 Trustees' Report for the period through 2089 is shown in **Figure 1**, both with and without an adjustment for changes in the age-sex composition of the population. The projected age-sex adjusted rate is relatively flat, rising only slightly over the projection period because the two variables having the largest long-run effects are disability prevalence and life expectancy, which have offsetting effects (and only for older men and women; there is no variable in the model which has a significant effect on long run LFPRs for younger men and women). The unadjusted rate falls, primarily because of increases in the relative size of the older population Age-adjusted projections separate by gender are shown in **Figure 2**, both with and without an adjustment for age composition The age-adjusted projected LFPRs are also relatively flat for the same reasons as are the combined rates, and the unadjusted rates also fall for both sexes for the same reason.

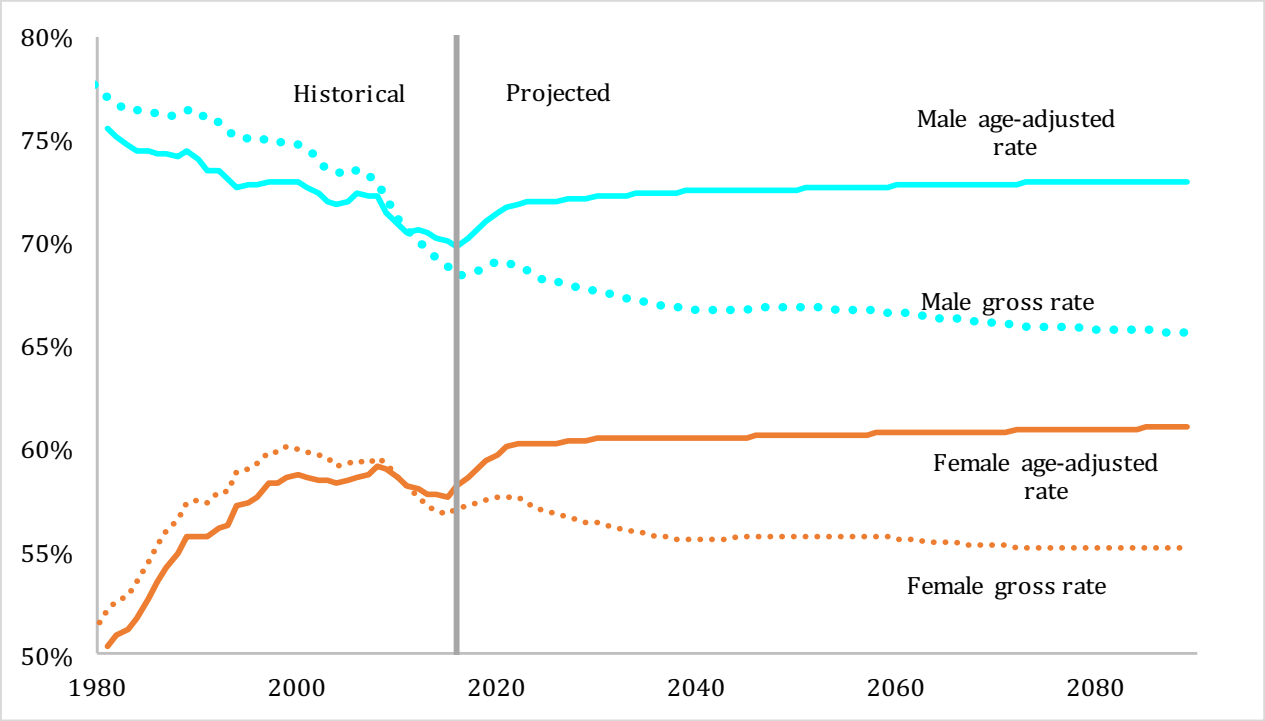
1 The basic description of the OCACT labor force participation module can be found in the online document "Long-Range OASDI Projection Methodology" available online at: *https://www.ssa.gov/OACT/TR/2016/2016_LR_Model_Documentation.pdf*. The document is updated each year. The Panel also benefited from presentations by OCACT staff. All materials presented to the Panel by OCACT can be accessed at the website of the Social Security Advisory Board.

Figure 1: Total labor force participation rate, males and females ages 16 and over: historical and OCACT projected (2016–2089) based on Trustees' 2016 intermediate assumption



Source: Office of the Chief Actuary

Figure 2: Labor force participation rate by sex, ages 16 and over: historical and OCACT projected (2016–2089) based on Trustees' 2016 intermediate assumptions



Source: Office of the Chief Actuary

Figures 3 and 4: Labor force participation rates for ages 30–34 and 60–64: historical (1971–2015) and OCACT projected (2016–2089) under Trustees' 2016 intermediate assumptions

Figure 3: Males

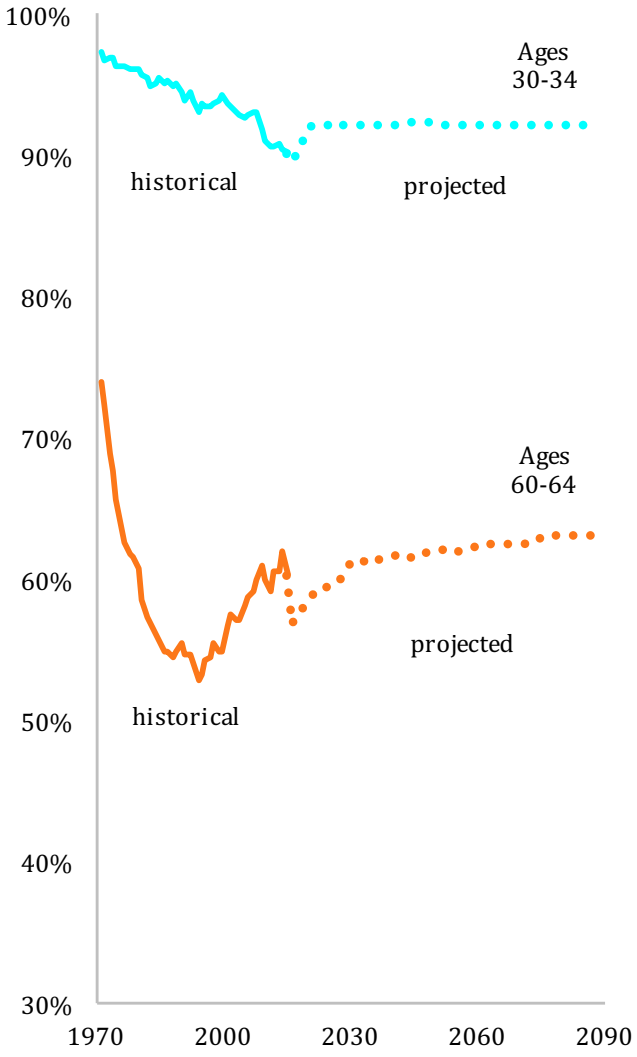
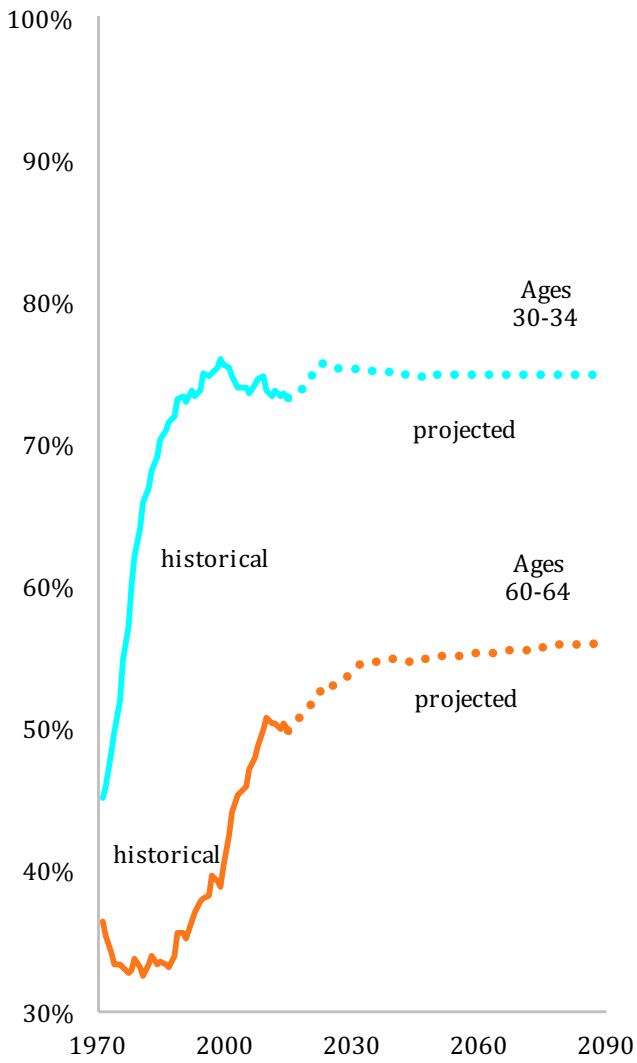


Figure 4: Females



Source: Office of the Chief Actuary

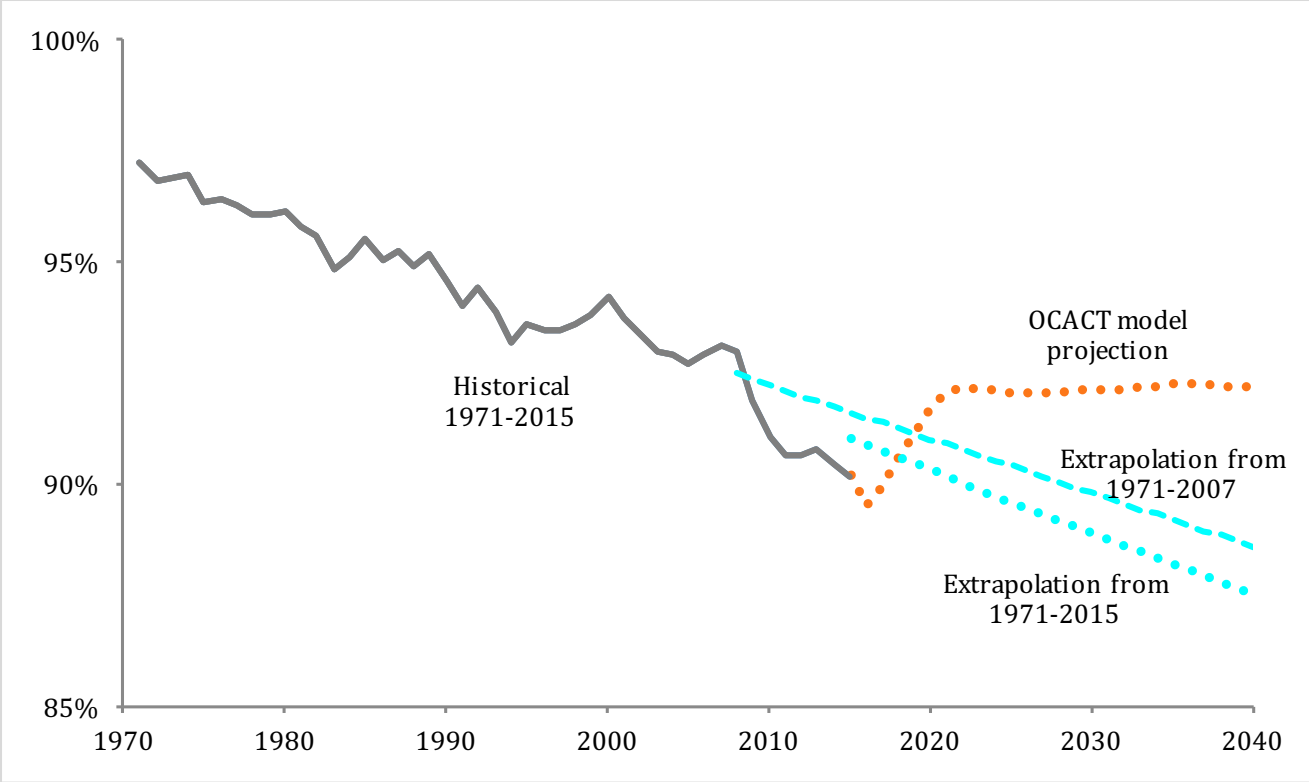
2. Projections by Age and Gender

The Panel focused its attention on the model itself and not on the effect of future changes in age-sex proportions. For this purpose, it began by examining the LFPR projections from the OCACT module separately by gender and age group. Further, the Panel focused on how the projections from the module compare to historical trends and experience.

Figure 3 shows the historical trends 1971–2015 and projections 2016–2089 from the Trustees' module for men 30–34 and 60–64. Those for women of the same two ages are shown in **Figure 4**. Trends for most prime-age men and women in other age ranges are similar to those of the 30–34 age group and those for most older men and women are generally similar to those for the 60–64 age group.[2] Figures for all age groups will be shown in the online Appendix.

2 However, the downward trends for men and women 16-19 were much larger than for older individuals, and the OCACT projections for these groups are all flat (see the Appendix). We discuss these groups below.

Figure 5: Labor force participation rate, males ages 30–34: comparison of OCACT model projection with extrapolation of linear trends 1971–2007 and 1971–2015 through 2040



Source: Office of the Chief Actuary; Panel extrapolations.

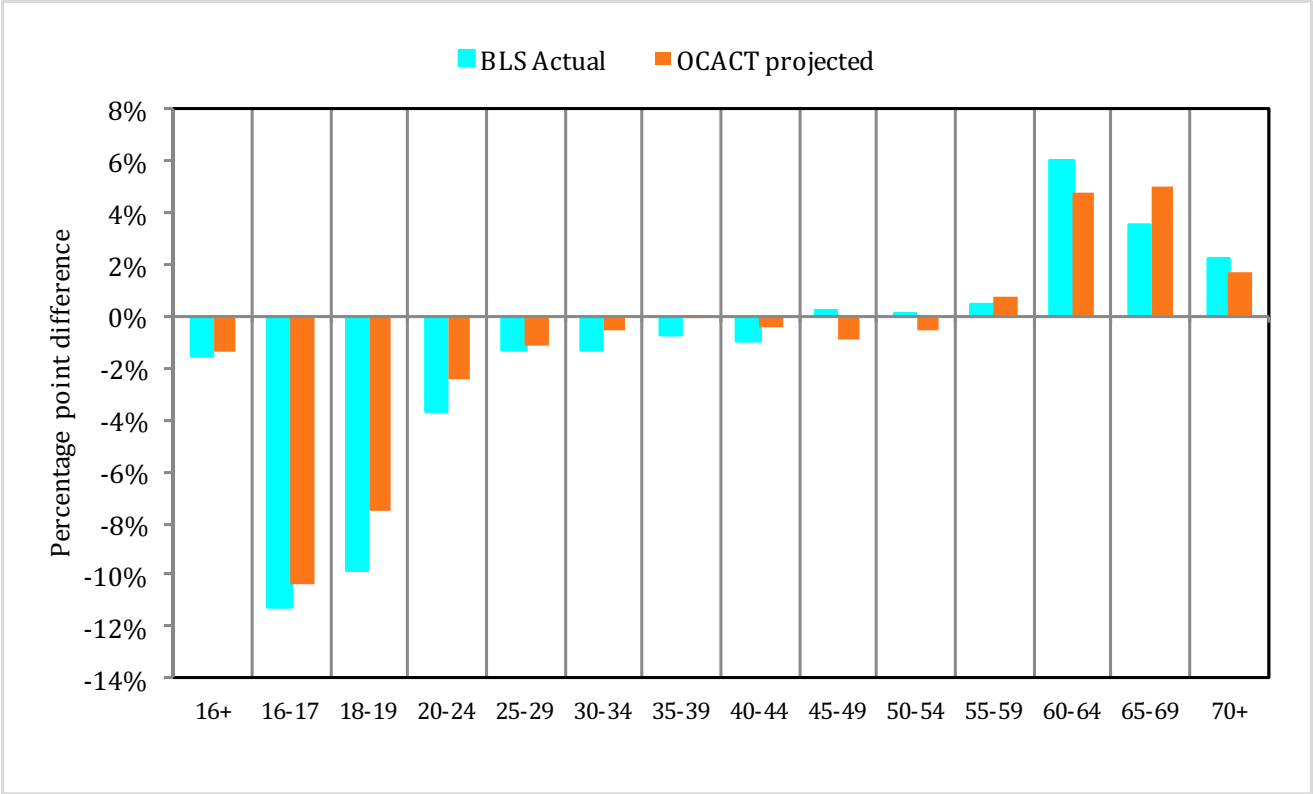
Taking the results for men first, the LFPRs for those 30–34 have been trending downward since 1971, although at different rates depending on the time period. Rates fell steadily through 1992, then fell at a slower pace through 2006, just prior to the Recession (this may be easier to see in Figure 5 below). They then declined sharply during the Recession. There has been a great deal of research conducted on the reasons for the long-term decline which we discuss in the next section. However, for present purposes, we wish only to note that the OCACT projection is that there will be a sharp recovery from the Recession ending in 2021, followed by a virtual complete flattening out of the trend. The projection model therefore assumes that whatever forces were causing the 35-year decline from 1971 through 2006 will abruptly cease.

Alternative projections of future LFPRs which simply linearly extrapolate from historical trends are shown in **Figure 5**. An extrapolation of the trend using historical data 1971 to 2007 only—and therefore excluding the Recession years—through 2040 would project an LFPR that is below the OCACT model projection, reaching about a 1.7 percentage point difference by 2026 and a 3.0 percentage point difference by 2035. Such a projection implicitly assumes that whatever forces have caused the long-run trend will continue at the same pace into the future. If the Recession years are included, which is justifiable only if the declines in those years are reflecting a trend rather than a cycle from which at least some recovery will occur, even lower future LFPRs are projected.[3]

The historical trends for men 60–64 shown in Figure 3 are quite different. After a long-term decline in the LFPRs of older men, LFPRs reversed course and began rising in the mid-1990s. Contributors to the rise in those LFPRs which have been mentioned include increases in health, increases in wage rates and work experience, declines in the relative level of Social Security benefits, an increase in relatively less physically demanding jobs, accommodation requirements, and increases in life expectancy. But the rise in older men's LFPRs showed signs of slowing down prior to the Recession. The OCACT projection for this group, which projects a slow continued increase in LFPRs after

3 It is worth emphasizing that the Panel is not necessarily recommending that the OCACT add linear or even nonlinear trends to their model in this crude a form, nor is the Panel, by showing linear extrapolations, arguing that linear trends will continue. The aim of Figure 5 is just to illustrate the deviation of the OCACT projections from a simple linear continuation of historical trends.

Figure 6: Changes in male labor force participation rates 2000–2007: BLS estimate and OCACT projected, by age group



Source: Office of the Chief Actuary

recovery from the Recession, are not inconsistent with the trends just prior to the Recession, although some might believe that a strong upward trend will resume.

Trends for both prime-age and older women are different from those of men (Figure 4). For prime-age women, as illustrated by those 30–34, LFPRs experienced a long-term increase starting in the 1950 and 1960s (those years not shown in the Figure), most commonly thought to be a result of increases in job opportunities for women, declines in child-bearing, increases in levels of education, and reductions in discrimination. However, those long-term increases began slowing down in the 1990s for all age groups. While those for women 30–34 shown in Figure 4 have essentially flattened out, those for some other age groups have actually declined (see online Appendix). The causes of this slowdown and flattening, if not decline, are not well understood. However, the OCACT model, which projects a flat trend in the future, is, like that of older men, consistent with the recent historical record.

The LFPRs of women 60–64 did not flatten out prior to the Recession but continued to rise through 2006, at which point they stopped their growth as the Recession began. The projection from the OCACT model shows a continued rise after the Recession, followed by an eventual flattening out. Again, such a projection is roughly consistent with the pre-Recession trend.[4]

The greatest differences between historical trends and the projections from the OCACT model therefore arises for prime-age men. The Panel concluded that a first question relevant to this difference was whether the OCACT model is capturing the downward trend in prime-age male LFPRs prior to the Recession by the variables that are in its model. Answering this question requires additional analysis because the projections ordinarily conducted by the OCACT staff do not involve backcasting the model to prior periods. However, at the Panel's request, the staff conducted an exercise of this type to assist in answering the question of interest. To keep the problem manageable, the Panel asked the staff to compute projections from the OCACT model over the 2000–2007 period, and to compare its projections to the actual changes in LFPRs over that time, for men. This required the staff to construct all the variables determining

4 An even greater projected increase from the OCACT model is estimated for women 65-69. See the Appendix.

LFPRs in all projection equations as described in the last section over that period, which required a good deal of work.

The results are illustrated in **Figure 6**, which shows both the projected change in the LFPR of men from 2000 to 2007 from the OCACT model and the actual changes over that period. The leftmost bars show the changes for men age 16+ as a whole. The difference in the model-projected change and the BLS estimate of the actual change overall is small, with the former equal to a 1.3 percentage point decline and the later equaling a 1.6 percentage point decline. However, the small difference overall masks more important differences by age. For men 16–17, for example, the actual decline was 11.3 percentage points but the model projects only a 10.3 percentage point decline, and there is a similar difference for those 18–19.[5] Although the magnitudes are much smaller for older age groups, the OCACT model under-predicts the decline for all men under 45. For men 45–60, both actual and OCACT-projected changes are small and differ little, while for men over 60, the OCACT model sometimes over-predicts and sometimes under-predicts the actual change.

The declines in LFPRs for young men deserve special attention because of their magnitudes. Research on this group has suggested that a majority of the decline in this group is among those working while in school. Why this has occurred and whether it will continue into the future, is unknown, but the causes of the trend may be quite different than those for older men. The OCACT model's projection of declines for young men is mostly a result of entering a simple time trend in the model (a time trend is included only for younger individuals; see Section 1 above). Entering a time trend helps fit the data but, without having an idea of its cause, does not assist in projections. The trend is indeed assumed not to be present in the OCACT projections beyond 2015 and, hence, whatever forces were generating the time trend effect are assumed not to continue into the future. More attention needs to be paid to this demographic group.

As a general principle, models making future projections should be able to explain the recent historical past and, after having done so, should decide whether the forces explaining those historical trends are likely to continue into the future. The Panel therefore makes the following general recommendation:

Recommendation 1. **The Office of the Actuary should put additional effort into systematically exploring the capability of its labor force projection module to explain pre-Recession historical trends, and should explicitly consider which, if any, of the forces generating recent historical trends are likely not to continue into the future.**

5 Other researchers have also had a difficult time explaining this downward trend for very young men.

3. Causes of Pre-Recession LFPR Trends of Prime-Age Men

There has been a considerable amount of research into the causes of the secular decline of the labor force participation rate and a related concept, the employment-to-population ratio (often just called the "employment rate"), of prime-age men (Aaronson et al., 2006; Moffitt, 2012; Banerjee and Blau, 2016; Council of Economic Advisors, 2016). Possible contributing factors that have been suggested include changes in demographic patterns, especially the decline in marriage; increases in incarceration; declines in health; increases in the receipt of transfers such as Disability Insurance and welfare programs for low-income individuals; and increases in the length of time spent in school among younger men.

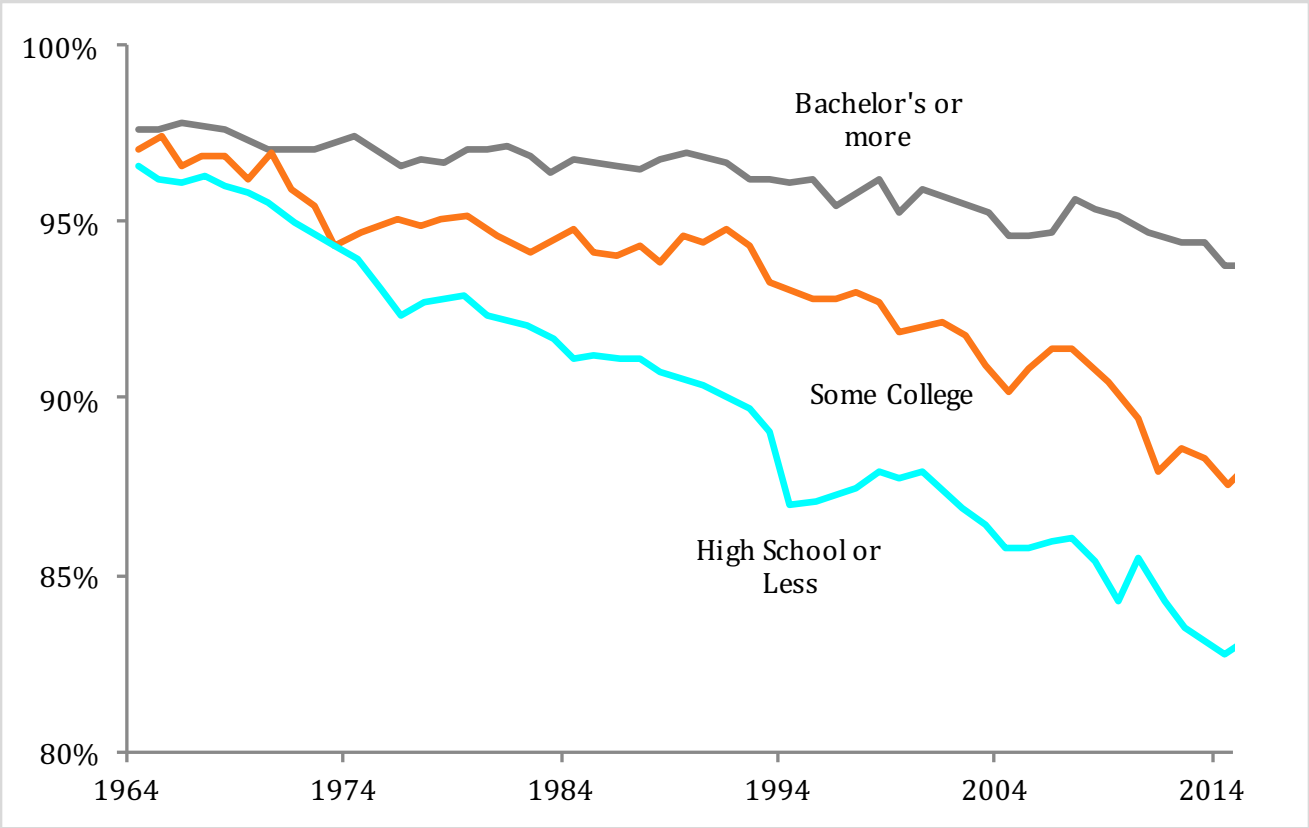
The leading explanation is that the decline has been related to declines in labor demand, especially for less-skilled and younger men. That decline has been most strongly indicated by the decline in the wages of less-skilled and less-educated men, sometimes declines in real wages but more often declines relative to the wages of more-skilled and more-educated men (see Figures 9 and 10 in Autor, 2010, for one illustration). The causes of decline in demand have been ascribed to skill-biased technological change, automation, globalization, and a number of other factors, although there is no consensus on the relative weights to be assigned to different factors. The well-known decline in employment in manufacturing is consistent with this explanation. Regardless of the source, the decline in relative wages has led to declines in labor force participation, as documented by Autor (2010, Table 2). Autor shows that a group's change in its employment-to-population ratio from 1979 to 2009 is strongly positively correlated with its change in its wage rate.

The consequences of this major trend for trends in the LFPR are illustrated in **Figure 7**, which shows dramatic differences in the LFPR by education going back to 1964 (see also Hipple, 2016, for additional detail). LFPRs for men with a high school education or less have fallen almost 15 percentage points over the period compared to declines of 10 percentage points for men with some college and a 6 percentage point decline for those with a Bachelor's degree or more.

Will these differential trends continue into the future? It is not possible to say this with certainty but most economists agree that there is no evidence that the trends will not continue, at least over the short-term or medium-term.[6] The forces of technological change, automation, and globalization show no

6 An additional question is whether general increases in the educational level of the population would have smaller effects than the cross-sectional trends by education level imply. This is an open question.

Figure 7: Prime age (25–54) male labor force participation rates by educational attainment, 1964–2015



Source: Council of Economic Advisers, "The Long-Term Decline in Prime-Age Male Labor Force Participation", June 2016. Bureau of Labor Statistics, Current Population Survey (annual Social and Economic Supplement); CEA calculations

signs of slowing down or halting, nor is there any sign that the wage rates of low-skilled men are catching up to those of more-skilled men. The OCACT model does not include any education effect for men or women under 45 and, even for the older individuals, there is only an adjustment for the composition of education, not for differential trends. This leads to the Panel's second recommendation:

Recommendation 2. **The OCACT model should allow for differential trends in labor force participation by level of education, and should assume that the forces underlying those trends will continue at least over the medium term. Further, consistent with Recommendation 1, the OCACT model should be modified to capture pre-Recession trends by education.**

While incorporating differential trends in LFPR by education is our primary recommendation, other factors that have been suggested for prime-age male decline should be investigated. One factor often mentioned more recently are declines in health. Case and Deaton (2015, 2017) have shown that increases in midlife rates of suicide and drug poisoning among white individuals have been so large as to drive up all-cause mortality rates in that population. Krueger (2016) has shown that the fraction of men who are out of the labor force because of disability has been rising, and that this is not a result of increases in the SSDI caseload. There are several existing data sets which have sufficient sample sizes and sufficient information on labor force participation, health, and disability to conduct an examination of their relationship. These include the National Health Interview Survey, the American Community Survey, the Current Population Survey, and the Health and Retirement Survey.

Incarceration has also been mentioned as a factor leading to declining LFPRs of prime-age men. Incarceration rates have risen dramatically over the last 30 years and it has been shown in research that a record of past incarceration leads to difficulties in finding a job after release (Pager, 2007; Raphael, 2014; Schmitt and Warner 2010).

Although the data barriers on this subject are greater than those for marriage or health, an investigation of whether an effect of this kind could be incorporated into the OCACT model is recommended.

Trends in health are likely to have contributed to pre-Recession trends and, in addition, are likely to continue into the future.

Mass incarceration rates are no longer rising and there is a movement to reduce them, but the stock of men who have been incarcerated in the past will not fall for many years. These factors, therefore, both help explain pre-Recession trends and should affect projections into the future.

4. The Recession

The Great Recession which began in 2008 was associated with a large reduction in labor force participation rates, which is clear from Figures 3 and 4 and those in the forthcoming Appendix. A question that must necessarily be addressed in any model projecting LFPRs into the future is whether these LFPR declines were temporary or permanent. Much thinking about business cycles suggests that such declines are temporary and therefore that LFPRs will return to their pre-recession levels, but it is also possible that recessions have direct long run impacts on LFPRs or that there are underlying factors which have contributed to LFPR declines which will continue into the future. Another possibility is that recessions only have temporary effects but that there is a long-term trend which is continuing into the post-recession period, resulting in LFPRs which return not to their pre-recession levels but to a long-term trend line instead.

Regarding the last of these, while it is often suggested that recessions have permanent effects on the labor market and on other sectors of the economy, and while there is some evidence for such effects (Davis and von Wachter, 2011), it is difficult to measure such effects with confidence. Determining whether a recession has a permanent effect that changes the trend value of economic variables requires first establishing what the long-term trend is, and that is a difficult task, as already emphasized. Consequently, the conservative assumption that is generally made in projection models (including those of the Congressional Budget Office, the Federal Reserve Board, and others as well as the OCACT model) is that the labor market will return to its long-term trend after the Recession has completely phased out.

However, while the assumption that the Recession has no long-run, permanent effect on the labor market is the conservative one, it does not imply that the market will return to its pre-Recession level if there are long-term trends which continue to assert themselves after the Recession. As we noted in Section 2, the data in the years just preceding the Recession show clear evidence of trends in LFPRs, at least for prime-age men. Further, as we discussed, the leading causes of those trends for younger men are very likely continuing at the present time and are likely to continue to do so at least over the medium term. Consequently, the issue of how to address the phase-out of the Great Recession cannot be separated from the issue of long-term trends which we have already discussed.

The statistics on LFPRs up to the current time strongly suggests to the Panel that LFPRs of prime age males will not return to their 2007 values. **Figures 8 and 9** repeat Figures 3 and 4 but have lines drawn showing the level of the LFPRs in 2007, in 2015 (the last year available as of the 2016 Trustees' Report), and how the post-Recession LFPR from the OCACT model compares to the level in 2007, the pre-Recession value. For men 30–34, for example, the OCACT model projects a recovery from the Recession back to a LFPR of 92.2 percent, below the 2007 value of 93.1 percent. But, in fact, in 2015, the LFPR was still at a low of 90.2 percent and had not starting rising. The official end of the Recession was in 2009, fully 6 years prior to 2015, and the unemployment had fallen far from its Recession peak. If the LFPR had not started recovering by that date, it is very unlikely to return to its 2007 value or anything close to it.

The patterns for older men and for women are different; those groups experienced smaller Recession declines and the OCACT model projects more-than-full recovery, with even higher rates into the future. As we previously noted, this is not inconsistent with historical trends for these groups and, for those groups, full recovery from the Recession is consistent with pre-Recession levels and trends.[7] But the implausibility of the projection for prime age men remains. This leads to the third recommendation of the Panel:

Recommendation 3. **The OCACT model should greatly reduce the magnitude of its projected recovery from the Recession for prime age men and should instead project that relatively little recovery will occur until the evidence suggests otherwise. The model should also construct the recovery to match the model's assumption of long-term values based on pre-Recession projected trends.**

The Panel investigated the question of whether lower projected LFPRs would affect the trust-fund balances over the 75-year projection period. Reduced LFPRs would lead to a reduction in the level of taxable payroll and therefore to a reduction in the rate of income received by the Social Security system. However, the reduction in taxable payroll will also lead to lower benefits paid out and hence to lower costs. At the Panel's request, the OCACT staff computed the income and cost implications of a LFPR that was 1.5 percentage points lower than that in the projections in the 2016 Trustees Report. The results, shown in **Table 1**, are that the net effect is quite small. The summarized income rate would actually rise slightly but so would the summarized cost rate, with a net effect of increasing the shortfall in the

7 For men 60-64, the OCACT model under-predicts male LFPRs for several years after the Recession and hence does not assume recovery to 2007 or 2015 levels for many years.

Table 1: Sensitivity of OASDI actuarial balance to changes in labor force participation rate

Result	2016 Trustees' Report (intermediate assumptions)	Intermediate LFPR minus 1.5ppt	Change
Summarized cost rate	16.50%	16.73%	0.23%
Summarized income rate	13.84%	13.87%	0.03%
75 year Actuarial balance	-2.66%	-2.86%	-0.20%

Source: OCACT calculations presented to the Technical Panel

Note: the summarized cost rate is the ratio of the present discounted value of program costs (benefit expenditures plus administration) to taxable payroll over the next 75 years. The summarized income rate is the present discounted value of program revenues to taxable payroll over the next 75 years. The actuarial balance is the difference between the summarized income rate and the summarized cost rate.

system (measured by the difference in the two rates) of only 0.20 percentage points.

While this is a useful and instructive exercise, whether this result would still hold if the long-term LFPR trends were significantly lower than 1.5 percentage points or if the other modifications to the model recommended in this report were followed, is something the OCACT may wish to pursue in the future but was not something the Panel had time to further investigate.

Another aspect of the OCACT labor force module which relates to how the Recession is phased out concerns the assumed business cycle effect used in the projections. The current procedure in the calculation of this effect is to only use pre-Recession data to estimate the effect of the unemployment rate on LFPRs. Using it to project post-Recession levels requires the assumption that the Recession had the same business cycle effect on LFPRs as did past recessions. This may not be the case, and the model should incorporate the data from the Recession as well as from previous recessions to obtain a balanced estimate of business cycle effects on the LFPR. The Panel recommends that the Actuary incorporate data from the Recession when estimating the business cycle effects on LFPRs that are important to the medium term projections (i.e., for how long it will take for the unemployment rate to return to its long-term level):

Recommendation 4. **The OCACT model should incorporate data from Recession years in estimating its effect of the business cycle on the labor force participation rate.**

In addition to this fairly narrowly-defined objective, the Panel believes that the OCACT model should fully incorporate the Recession years into its analysis. This would include, for example, working to ensure that the model "explains" the LFPRs in the Recession years just as it should explain the pre-Recession trends.

5. Other Issues

A. Educational Composition

The OCACT model allows the level of education to affect only the LFPR of older individuals. As emphasized above, the Panel believes that education should be incorporated as a determinant of the LFPRs of all individuals and even that separate trends for those of different education levels should be incorporated.

A separate issue is how to project the educational composition of the population into the future. The current OCACT model assumes that cohorts younger than age 35 in 2014 will have the same completed years of education as those of that cohort. The reason for using an age as late as 35 is to ensure that education has been completed, for many individuals do not complete their education until their 20s or even later. However, the completed education levels of men age 35 in 2014 were, perhaps surprisingly, lower than that of previous cohorts, primarily because of an increase in the rate of high school dropout. This is illustrated in **Figure 10**, which shows trends in the high school graduation rate of 20–24 year olds by birth year. The cohort which is age 35 in 2014 was born in 1979 and the Figure shows that this was the trough year of the high school graduation rate. As a consequence, the OCACT model is projecting long term declines in the level of education, as older cohorts with higher high school graduation rates are gradually replaced by young cohorts who are assumed to have lower graduation rates. But the Figure shows that the trend has reversed and more recent cohorts have experienced higher graduation rates.

The solution to this problem is to go below age 35 and therefore to incorporate the more recent, upward trends in education levels. This will require modeling how education evolves over younger ages, but this task should be able to be

Figure 8A: Male labor force participation rate, ages 30–34: OCACT projections and levels in 2007 and 2015

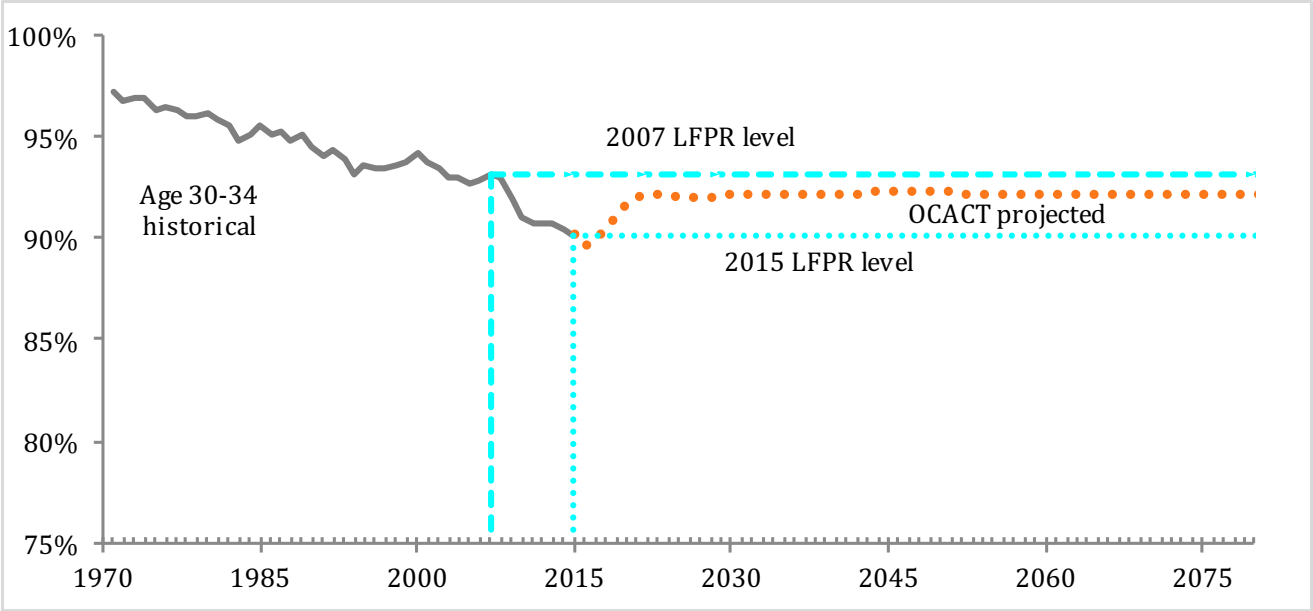
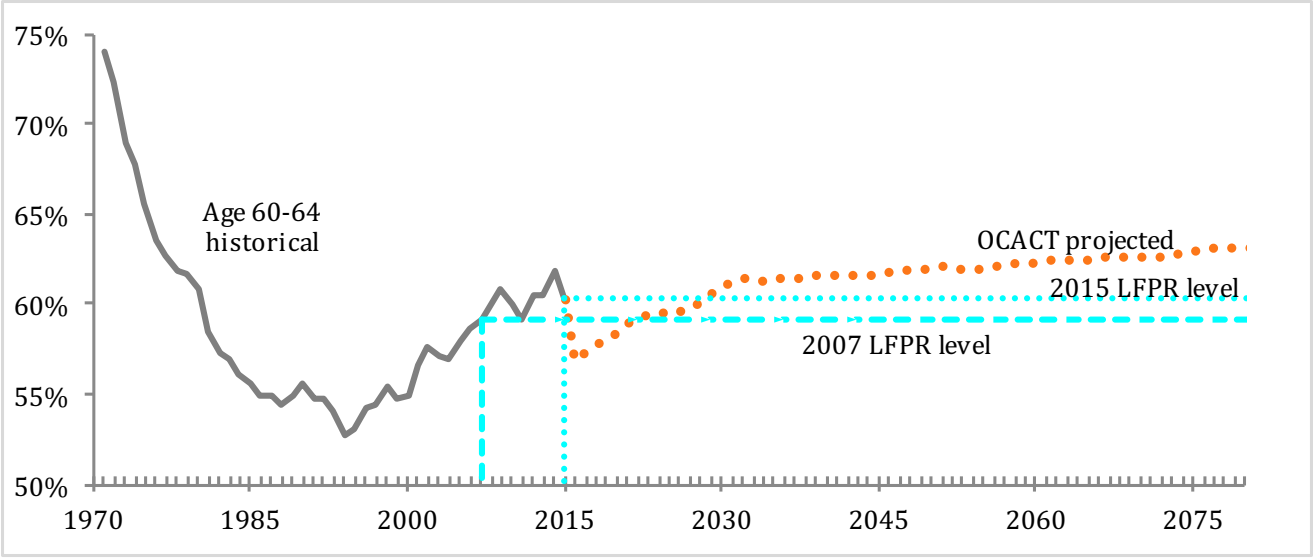


Figure 8B: Male labor force participation rate, ages 60–64: OCACT projections and levels in 2007 and 2015



Source: Office of the Chief Actuary

Figure 9A: Female labor force participation rate, ages 30–34: OCACT projections and levels in 2007 and 2015

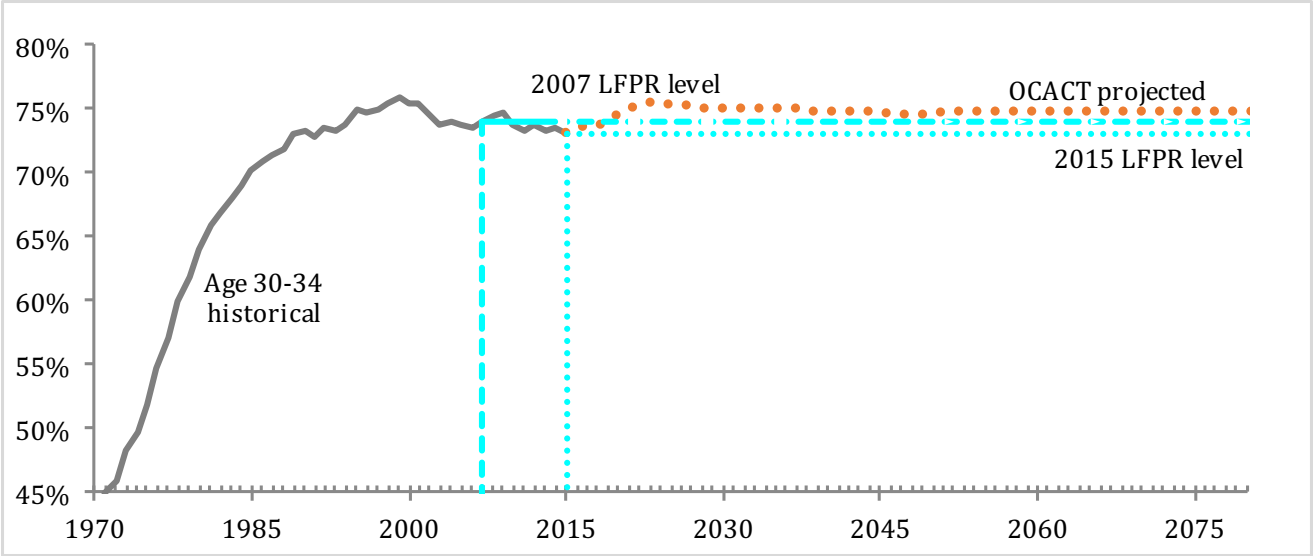
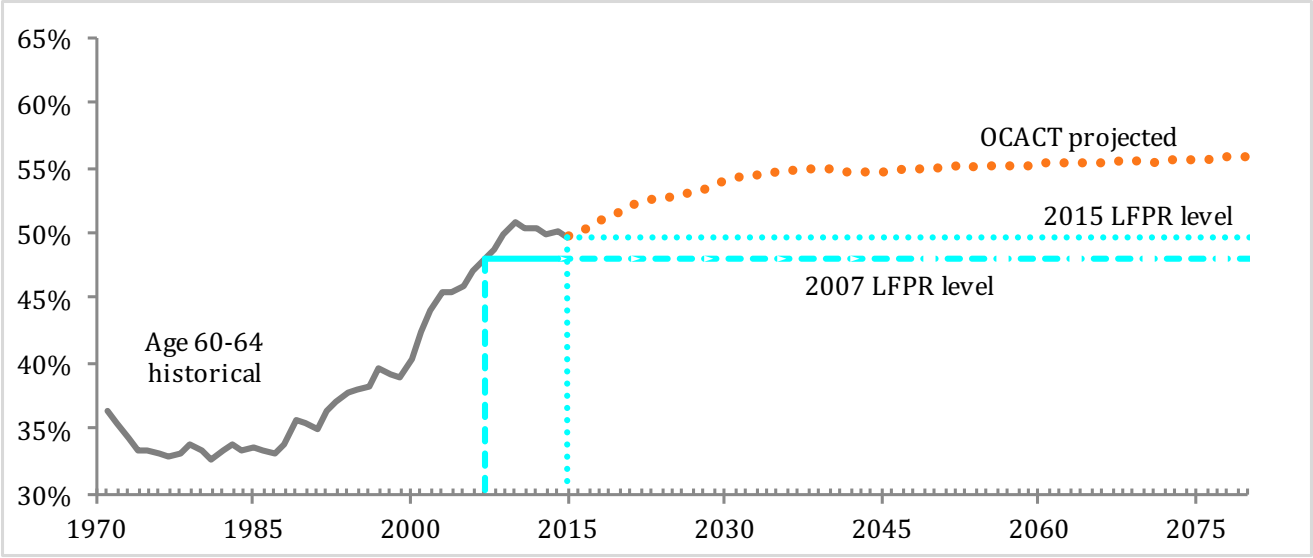


Figure 9B: Female labor force participation rate, ages 60–64: OCACT projections and levels in 2007 and 2015



Source: Office of the Chief Actuary

accomplished without undue difficulty. The Panel therefore makes the following recommendation:

Recommendation 5. **The OCACT model should modify its projection of completed educational distributions by using educational levels experienced by those younger than 35 and using the data from more recent cohorts to make projections.**

B. Life Expectancy

An important variable in the OCACT model is life expectancy, and it is one of the few variables which is assumed to change continuously over the entire 75-year projection period and to therefore continue to affect LFPRs. The method by which life expectancy is incorporated is rather indirect and difficult to explain, but it essentially builds on the idea that some fraction of the difference in LFPRs of individuals of different ages is the result of having different life expectancies. Roughly speaking, the assumption in the OCACT model is that 40 percent of such differences in LFPRs is due to different life expectancies, and this "add factor" is then used to increment the LFPRs of individuals in the model as life expectancies improve.

Aside from the advantages or disadvantages of calculating the effect of life expectancy on LFPRs in this particular way—as opposed to, say, a regression of LFPRs on life expectancy values controlling for other variables affecting LFPRs, which would be easier to understand but would also require a correct specification—it is not easy to validate the 40 percent figure assumed in the model. One way to validate it would be, in fact, to compare it to regression estimates to see if it is wildly different, which should not be the case if both methods are approximately close to the truth. Another method would be to approach the problem of validation in the same way as suggested previously for other issues, namely, to apply the 40 percent figure to historical data to determine whether plausible results are obtained. The historical data provide many observations by age and by life expectancy, which has been changing for many decades. Applying the 40 percent figure to older cohorts, and then observing their actual LFPRs at later ages, could serve to detect whether the 40 percent figure is sensible and plausible. The Panel therefore recommends the following:

Recommendation 6. **Some attempts to validate the 40 percent life expectancy add factor should be conducted, either by comparison to regression-based estimates or by applying the add factor to historical cohorts to assess its plausibility, or both.**

An additional consideration is motivated by recent research showing that trends in mortality and life expectancy are diverging between individuals of different income and education levels as well as by race and ethnicity (Bosworth, Burtless and Zhang 2016; Chetty et. al. 2016; Waldron 2007, 2013; NAS 2015). That implies that the impact of rising life expectancy on LFPRs is likely to be quite different for different groups in the population. Similar to our suggestion that the OCACT consider specifying different LFPR trends for different educational groups, specifying differences in life expectancies by education and other dimensions like race and ethnicity may also be worth investigating and may improve the OCACT forecasts.

C. Disability

The OCACT model incorporates the effect of disability on LFPRs by using a measure of the ratio of DI beneficiaries to the DI insured population, and projects that ratio into the future. Using data on the LFPRs of beneficiaries together with the assumption that DI receipt is random in the future population, an effect of increasing DI caseloads on future LFPRs is projected.

This is a straightforward and transparent method of estimating the effect of DI receipt on future LFPRs. However, recent research has found that DI application itself has a negative effect on LFPRs (Autor, et. al 2015). About a quarter of individuals who apply for DI have a waiting period of at least two years before a final decision on receipt is made, and in those two years the LFPR is generally zero. This mechanical effect implies that an additional two years of non-participation should be associated with any DI beneficiary, because it occurred prior to the date of the start of benefits. In addition, past research has shown that rejected applicants generally have very low levels of LFPRs even after the date of rejection (Bound 1989; Maestas et. al 2013; von Wachter, et. al. 2011). For both of these reasons, DI applications may have additional and independent effects from those of DI receipt itself.

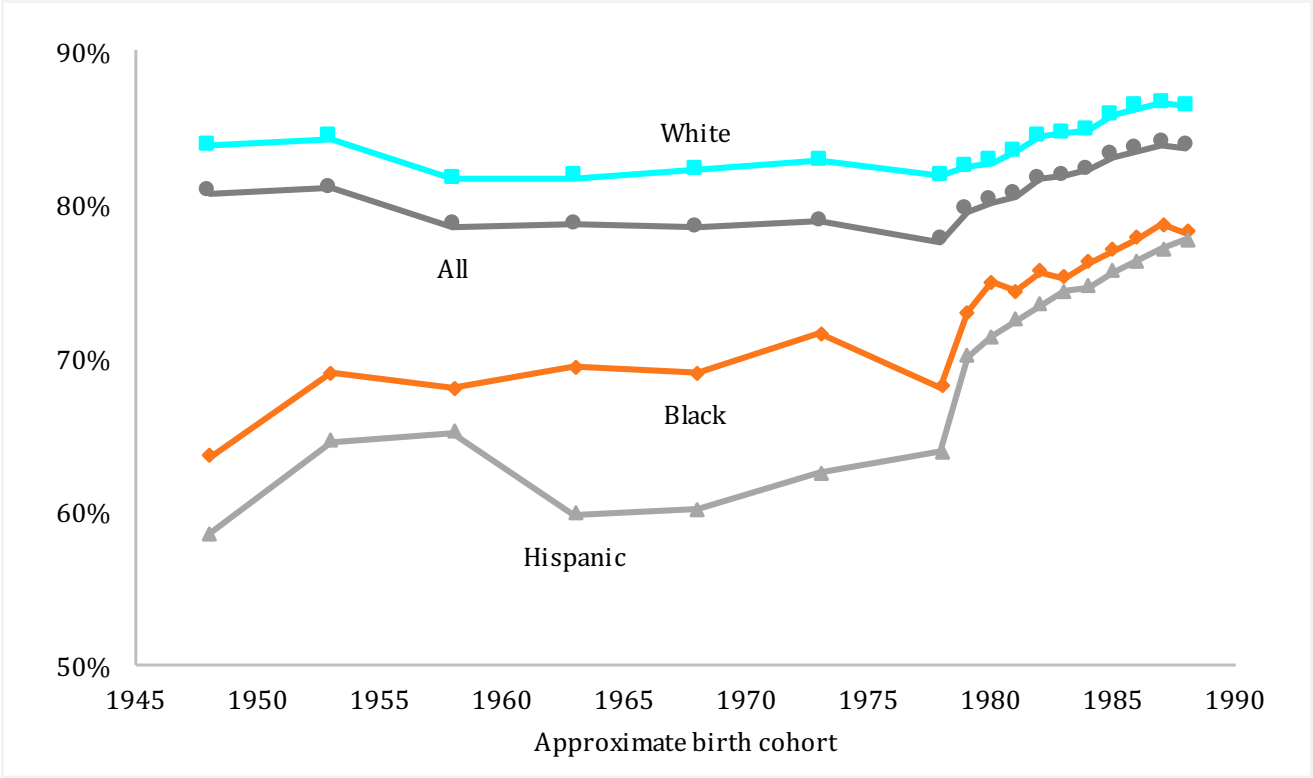
Addressing this issue should not be overly difficult since data on DI applications should be available to the OCACT staff. Allowing DI applications to have a negative effect on LFPRs even prior to actual benefit receipt, and incorporating a negative effect on LFPRs of rejected applicants, could be added to the model, could be added to the model.

Recommendation 7. **Incorporation into the OCACT model of an effect of DI application on LFPRs above and beyond benefit receipt itself should improve the accuracy of its LFPR projections.**

D. Older Worker Demand

The Panel was asked to consider whether shrinking cohort sizes of prime age workers as the Baby Boom cohort ages out of its prime years will result in an increase in labor demand

Figure 10: U.S. graduation rate for 20–24 year-olds by race/ethnicity and birth cohort



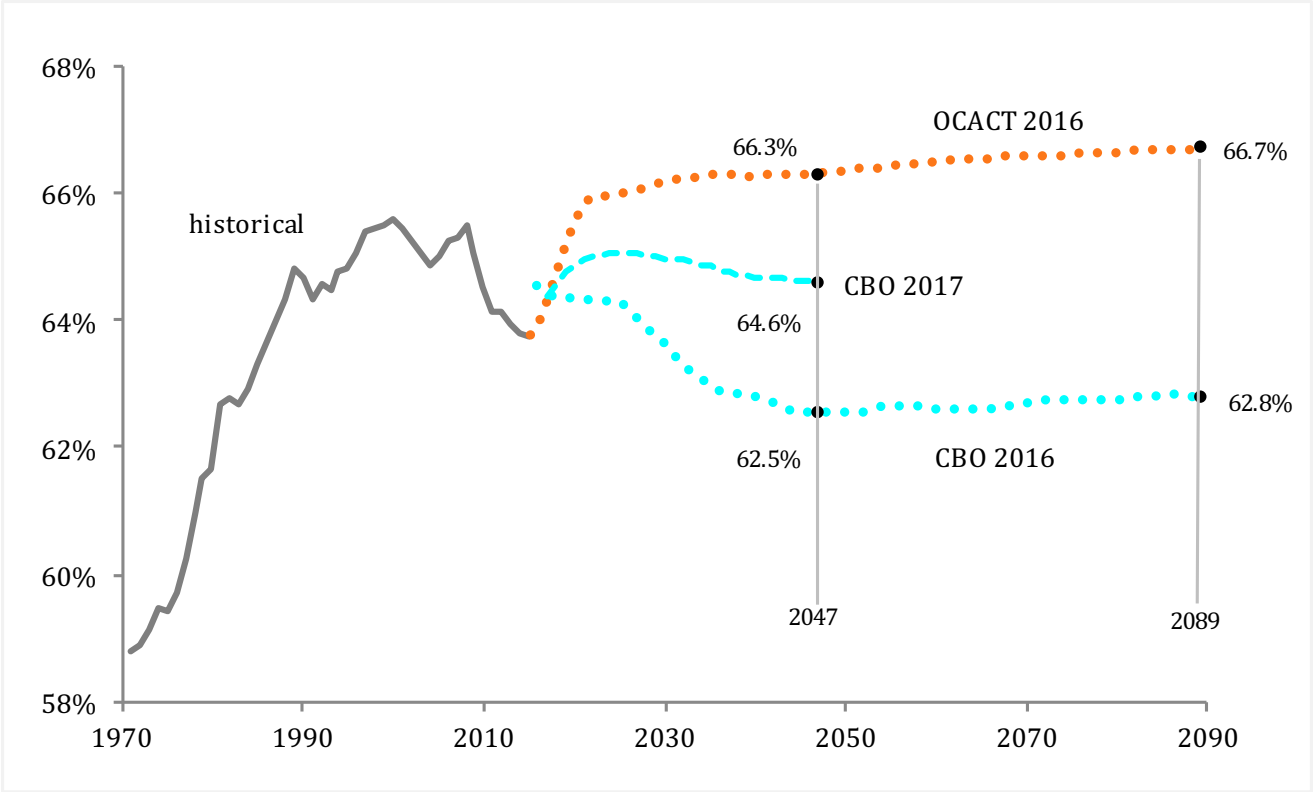
Source: Richard J. Murnane, "U.S. High School Graduation Rates: Patterns and Explanations." Journal of Economic Literature 5, no. 2 (June 2013): 370–422

for older workers, which could, in turn, raise the LFPRs and employment rates of those workers. Whether this will occur depends on several underlying factors, including the elasticity of substitution which firms face between prime-age and older-age workers as well as the degree to which the supply of older workers will increase. The price and supply of capital, as well as the elasticity of substitution between capital and older and younger workers, would also affect the calculation.

Detecting an increase in the demand for older workers should in principle be possible by determining whether there is an increase in wage rates paid to older workers of a fixed skill level. This is likely to be a rather difficult task because the baby boom cohort attained higher levels of education and a higher rate of return to their education than did earlier cohorts, so their wage rates as they enter the retirement years should be higher than those of previous cohorts for that reason alone. However, some evidence suggests that earnings of older workers have started rising relative to those of younger workers even holding education constant (Burtless, 2013, Appendix Figures 1 and 2). The current OCACT model allows educational composition to affect the LFPRs of older workers but the OCACT staff should monitor changes in earnings holding education fixed to determine if a trend is emerging which would be worth incorporating into the projection model.

Probably the best way to approach this problem is simply to continue to chart the LFPRs of older workers. Those of both men and women 60–69 have already been rising in recent years, so it is possible that forces in that direction may already be occurring. Alternatively, they could begin to rise even faster. It might be possible to relate the LFPRs of older workers to the wage rates they are offered, just as it was suggested earlier that the historical trends in the LFPRs of prime-age workers appear to be partly explained by trends in their wage rates. To the degree that LFPRs of older workers respond positively to the wages they are offered, it may not matter whether those wages are rising because of labor demand or from increases in their human capital if both factors increase their participation rates.

Figure 11: CBO and OCACT projections of labor force participation rates, male and female combined, ages 16+ (age and sex adjusted to 2011 population)



Source: Office of the Chief Actuary, Congressional Budget Office

E. Administrative Data

The OCACT model relies for its measures of the LFPR on survey data from the Current Population Survey. It is widely agreed that employment responses from the CPS are not fully accurate, and many employment episodes appear to not be reported by CPS respondents. Social Security administrative data on earnings reported to the SSA have been used in recent years to obtain more accurate measures not only of earnings but also of employment. A useful exercise would be for the OCACT to use those administrative data on earnings to validate its CPS measures of LFPR (by comparing the employment rates behind them), which could improve the accuracy of its measures of labor market activity and therefore provide more accurate projections into the future.

Recommendation 8. **The OCACT should investigate the usefulness of data on earnings reported to the Social Security Administration to improve the accuracy of its employment data.**

6. Comparison to Other Models

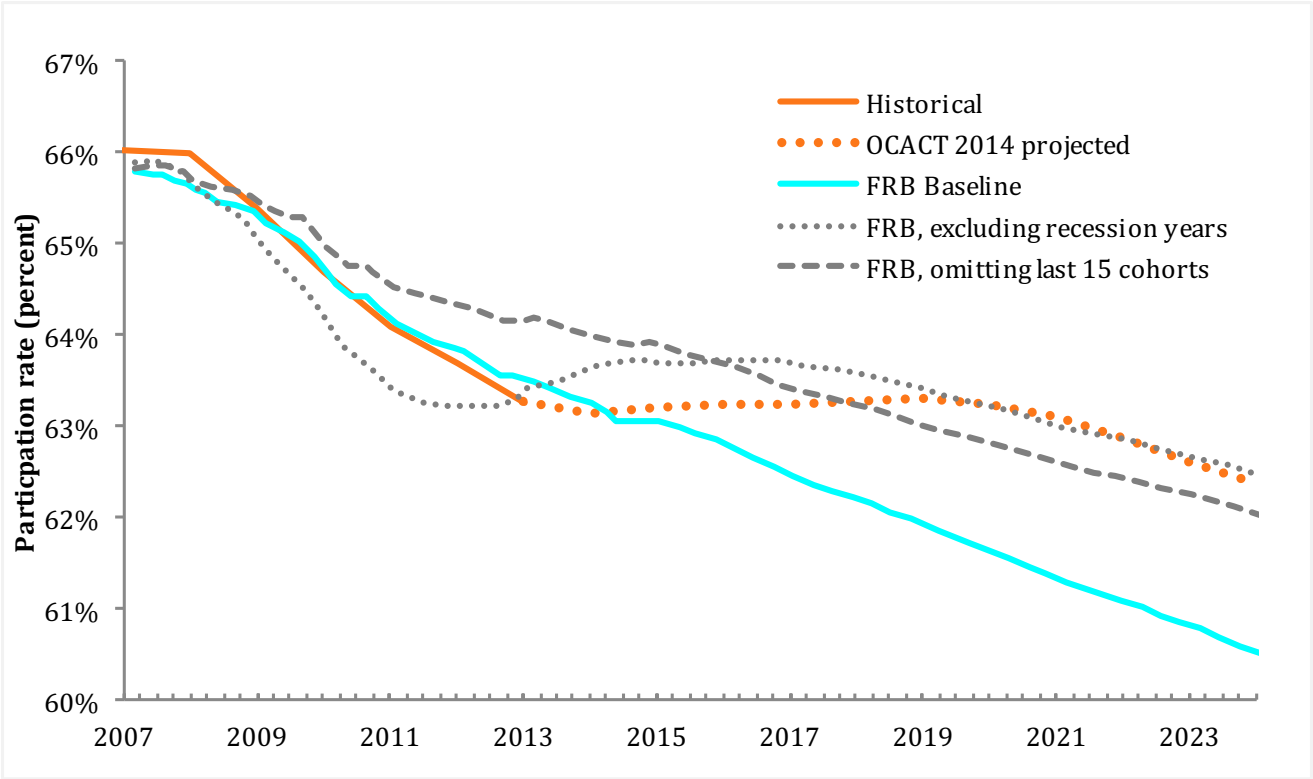
The Panel compared the OCACT LFPR projections to those made by the Congressional Budget Office (CBO) and the Federal Reserve Board. It investigated the CBO projections in more detail than those of the Federal Reserve because the CBO makes 75-year projections, similar to the OCACT, whereas the Federal Reserve only makes 10-year projections.

A. Congressional Budget Office

The CBO projections are based on a short-term projection model and a long-term projection model. In the past, the former has made 10-year projections while the latter has made 75-year projections. The long-term projection model incorporates the short-term projection results and calibrates its model to be consistent with them. Short-term projections are typically released in January or February of each year and long-term projections are typically released in June or July.

The upper red line in **Figure 11** shows the OCACT LFPR projections and the lower blue line shows CBO projections

Figure 12: Comparison of total labor force participation rate projections 2014–2024, between OCACT and Federal Reserve Board (3 alternative specifications)



Source: Aaronson, Stephanie, Tomaz Cajner, Bruce Fallick, Felix Galbis-Reig, Christopher Smith, and William Wascher. 2014. "Labor Force Participation: Recent Developments and Future Prospects." *Brookings Papers on Economic Activity* (2): 197–255. Figure 13.; Office of the Chief Actuary, 2014 Trustees Labor Force Participation projections based on intermediate assumptions.

reported in September 2016.[8] The CBO projection is far below that of the OCACT and the difference grows over time, reaching a gap of 3.9 percentage points in 2089. However, the middle purple line in the Figure shows the most recent CBO projections, reported in a blog posted in January 2017, which are obtained from a new version of the short-term model which projects out to 2047 and hence 30 years rather than 10 years. These projections are much higher than those previously reported by the CBO and close more than half of the gap that previously existed between the OCACT and CBO projections. The blog reported that the differences with their prior projections are primarily a result of upward estimates of the effect of education on LFPRs, downward estimates of the effect of the declining marriage rate on LFPRs, and newly incorporated influences of race and ethnicity. How large the gap will be over the entire 75-year period must await the long-term CBO projections expected in summer 2017 but, because they will incorporate the results of the short-term model, they are likely to be quite different than those reported in September 2016.

The reasons for the remaining difference in the CBO and OCACT projections cannot be determined because documentation on the new short-term model has not been released and the CBO staff did not provide to the Panel sufficient detail on the model to allow the Panel to make a determination. Documentation on the prior short-term model, which was released only in 2011 (U.S. CBO, 2011), is not relevant because the model has been changed in major respects. Documentation on the long-term model is only available even farther back (U.S. CBO, 2006, 2009) and that model, while reportedly similar in structure to that currently being used, is also not adequate to determine the reasons for differences with the OCACT model projections. Until such time as the CBO is willing to share the details of its projections with the SSAB or its staff or technical panels, the reasons for differences in LFPR projections will not be able to be ascertained.

B. Federal Reserve Board

The Federal Reserve Board (FRB) model projects LFPRs 10 years out. Projections from Aaronson et al. (2014, Figure 13 "baseline") through 2024 are shown by the black line in

8 The CBO lines have been calculated using historical mid-year Social Security area population data for 2011 from the OCACT. See *https://www.ssa.gov/OACT/HistEst/Population/2016/Population2016.html*.

Figure 12, along with the OCACT projections over the same period shown in blue.[9] The FRB Baseline projections are below those of the OCACT, reaching about 60.3 percent in 2024 compared to a 62.5 percent figure for the OCACT.

The model used for the FRB projections is well-described in Aaronson et al. (2014) and elaborated by testimony from Dr. Aaronson to the Panel. The model is regression-based and uses CPS data to estimate cell means for LFPR by age, gender, and year as a function of a number of variables, including the unemployment rate gap, the personal bankruptcy rate, the percentage with a college degree, life expectancy, OAS penalties for early retirement, the minimum wage, the number of DI recipients, variables for marital status and child, and dummy variables for birth cohort year by gender. The model is estimated on data covering the years 1965 to 2014, and omits cohort effects from the ten most recent cohorts.

This is a very different model from that of the OCACT and contains many different determinants of LFPRs. In addition, the model is estimated including the Recession years, unlike the OCACT model. The authors state that the cohort effects in the model explain the majority of the decline in the age-sex adjusted LFPR from 2007 to 2014 (Table 3). Dr. Aaronson also testified to the Panel that omitting cohort effects from the model resulted in a lack of fit to the LFPR data over this period. Indeed, the unemployment rate in the FRB model explains very little of the LFPR trend, implying that the business cycle experienced during the Recession had essentially no effect on LFPRs.

Two additional lines in Figure 12 show the effect of excluding the Recession years in the estimation and of alternative methods of estimating cohort effects. Omitting the last 15 cohorts in the data (dashed line) raises the LFPR projections considerably, with a 2024 LFPR projected rising to 61.9 percent. This test is informative because there are relatively few observations on those cohorts to determine their long-term LFPR profiles and it is difficult to separately identify such cohort effects from the unemployment rate (and, as we noted previously in our Report, LFPR declines among young men and women have been particularly strong). Figure 12 also shows that if data from the Recession years are omitted from the estimating model (dotted line), implying that the business-cycle effect is estimated only from prior recessions, somewhat larger LFPRs are projected, reaching 62.3 percent in 2024, only slightly below those of the OCACT model.

The Panel has concluded that the projected LFPRs from the FRB model are sensitive to specification and are implausible in some respects, particularly the suggestion that the high unemployment rates in the Recession had little or no effect on LFPRs. The separation of cohort effects from the unemployment rate during the Recession is, more generally, a difficult task. The Panel believes that, as more post-Recession years of data become available, cohort effects should continue to be examined, as they can be more reliably estimated with such data. In the meantime, the Panel recommends that the OCACT staff implement the other recommendations made in this Report to assess how their LFPR projections are affected by those modifications.

9 We refer to this model as the "Federal Reserve Board" model even though it is only used as input to official Board projections and is not identical to them.

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