Introduction

Many plans to restore long-term solvency to the Social Security system include a proposal to raise the age of eligibility for full retired worker benefits, known as the normal retirement age (NRA). Until 2000, eligible workers could retire with full retired worker benefits at age 65 and with reduced benefits as young as 62. Beginning with workers turning 62 in 2000, however, the NRA is rising by two months a year until it reaches 66 in 2005. It will stay at 66 until 2017 when it begins another gradual increase to 67.

While it remains to be seen how these changes affect behavior, available research suggests they will do little to alter labor force participation rates (Burtless, 1998). Simulations by Fields and Mitchell (1983) about the time Congress voted to raise the NRA from 65 to 67 indicate a modest impact of a higher retirement age on behavior. Fields and Mitchell in fact modeled raising the NRA to 68, rather than the legislated 67, and estimated that an increase of that magnitude would raise average retirement age by less than two months. More recent simulations by RAND also indicate that while the behavioral impact of an increase in the NRA would be small, roughly 5 percent in Old-Age and Survivors Insurance (OASI) benefits would be saved for each one-year increase (Panis, et al., 2002).

As discussed below, older workers might, for reasons unrelated to changes in the NRA, be increasingly receptive to working longer and, as a result, voluntarily push up the average age of retirement. This Issue Brief assumes that rising percentages of men and women will be working into their late 60s and beyond. Using projections of the Bureau of Labor Statistics and the economic model of Macroeconomic Advisers, LLC (MA), the brief simulates the macroeconomic impact of this development.

Labor Force Trends in the Developed World

Throughout the developed world, labor force participation rates for the 65-plus population have fallen over the past 50 years. With few exceptions, those rates are currently below 10 percent and often less than 5 percent. As of 1999-2000, the exceptions included Japan (22.6 percent), Iceland (21.6 percent), Norway (11.1 percent), Portugal (17.6 percent), Switzerland (10.5 percent), and the United States (12.8 percent) (International Labor Organization, 2002).

In virtually all of these countries, a shrinking ratio of workers to retirees has generated growing concern about the cost of retirement support and interest in the contribution that prolonging worklives could make to the solvency of public pension systems. The United States is no exception, where a common proposal involves eliminating the hiatus between the time the NRA reaches 66 and when it begins rising to 67. Accelerating the increase in the age of eligibility for full Social Security benefits so that it is fully in effect by 2016 instead of 2027 would eliminate an estimated 5 percent of the long-term Social Security deficit projected as of 1998, according to Social Security Administration actuaries (Social Security Advisory Board, 1998).

Other Social Security reform plans have recommended raising the full benefit retirement age beyond 67. An NRA of 70, phased in by increasing the NRA one month every two years after the accelerated increase in the rise to 67, would eliminate 22 percent of the Social Security program's long-range deficit projected as of 1998 (Social Security Advisory Board, 1998). Some Social Security
reform plans would index increases in the retirement age to improvements in life expectancy, which at age 65 is more than five years longer than it was when the Social Security Act was passed in 1935. Analysts note that if the ratio of working years to retirement years remained at the level it was when benefits were first paid, the NRA today would be closer to 70 or 71 (Social Security Advisory Board, 1998).

A number of other countries are attempting to increase labor force participation rates and reduce the rate of growth in pension outlays by raising the age of eligibility for public pension benefits. Japan is gradually raising the eligibility age for full benefits under the employees’ pension plan to 65; it had been 60 for men and 58 for women. Germany is eliminating incentives to retire before age 63. Italy has increased the age of retirement in the private sector from 60 to 65 for men and from 55 to 60 for women. In addition, many countries are equalizing the pensionable ages for men and women, generally by increasing the age for women.

Increasing the age of eligibility for pension benefits is unpopular. Though there is some evidence that the trend toward ever earlier labor force exit has ended or even reversed in a number of countries (Organization for Economic Cooperation and Development, 2000), from the perspective of workers, voluntary early—often very early—retirement can be viewed as a 20th century success story.

**Toward a Voluntary Longer Worklife?**

Workers apparently do not want to be told that they must work longer to receive full retired worker benefits1—and, in fact, most Americans are unaware of the rising NRA (Americans Discuss Social Security, 1998; Employee Benefit Research Institute, 2000). Nonetheless, workers seem poised to push back average retirement age by choice. For example, some 70 to 80 percent of U.S. boomers report that they expect to work at least part-time in retirement, primarily because they want to work or like what they are doing (AARP, 1998, 2002). Other studies reveal similar expectations about, or interest in, post-retirement employment (e.g., Civic Ventures, 1999; Yakoboski andDickemper, 1997).

Boomers, in particular, are approaching conventional retirement age better educated and in better health than older workers in previous decades, which should make them more interested in and capable of working longer. Flexible schedules and alternative work options—some of which hold particular appeal to older workers in search of nontraditional work schedules and opportunities—are more widely available than they were in the early 1980s.

Slowing labor force growth and labor shortages may cause more employers to attempt to attract and retain older workers. In addition, heightened awareness about rising life expectancy and concern about retirement income adequacy may prompt growing numbers of workers to postpone retirement. In other words, the Social Security retirement age increase being phased in may not itself be instrumental in keeping larger numbers of older workers in the labor force, but other developments could have a substantial impact.

**Labor Force Projections**

Data from the U.S. Bureau of Labor Statistics (BLS) provide evidence that older workers are remaining in the labor force somewhat later in life. After decades of decline, the labor force participation rate for the 65-plus population in the United States leveled off in the mid-1980s and then began to inch upward. In 2001, 13.1 percent of persons 65 and older were in the labor force. Moreover, the participation rate for the 65-69 age group has also increased, reaching 24.7 percent in 2001 (Table 1).

---

1 The majority of workers now opt for benefits before the NRA, most commonly at age 62.
Although projections point to an older workforce in coming decades, BLS projects relatively little increase in the labor force participation rate of persons 65 and older between now and 2030. If BLS's projections prove close to the mark, only 15.2 percent of men and women in this age group will be in the labor force in 2030 (Toossi, 2002), compared to 13.1 percent in 2001.2

<table>
<thead>
<tr>
<th>Year</th>
<th>65-69 (%)</th>
<th>65+ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>18.4</td>
<td>10.8</td>
</tr>
<tr>
<td>1990</td>
<td>21.1</td>
<td>11.9</td>
</tr>
<tr>
<td>1995</td>
<td>21.8</td>
<td>12.1</td>
</tr>
<tr>
<td>1996</td>
<td>21.9</td>
<td>12.1</td>
</tr>
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<td>1997</td>
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<tr>
<td>1998</td>
<td>22.5</td>
<td>11.9</td>
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<td>1999</td>
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</tr>
<tr>
<td>2000</td>
<td>24.4</td>
<td>12.8</td>
</tr>
<tr>
<td>2001</td>
<td>24.7</td>
<td>13.1</td>
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</tbody>
</table>


Might BLS figures underestimate actual participation rates? Quite possibly so, for some of the reasons highlighted in the previous section. But whether BLS may be over- or under-estimating future participation rates, the question this paper seeks to answer is how rising participation would affect such outcomes as Social Security benefit payments, the Social Security trust funds, and the economy as a whole.

2 Projections any distance into the future are fraught with uncertainty. Moreover, in the case of BLS statistics, detailed projections are available only to 2015, after which participation rates are held constant; participation rate changes after that date are due to changes in the composition of the population (Toossi, 2002). It seems more than likely that changes in values, norms, and expectations will increase the percentage for 2030.

The impact of a rising labor force participation rate naturally depends on a number of factors, particularly the size of the increase and whether or not workers are collecting their Social Security benefits.

As a result of legislation that abolished the Social Security earnings limit in 2000 for workers over the NRA, employment beyond the NRA no longer jeopardizes Social Security benefits. At present, there is little incentive for workers not to collect benefits at the full retirement age. Benefits are increased for each year that receipt is postponed after the NRA through age 69, and this delayed retirement credit (DRC) is gradually rising until it becomes more actuarially fair for workers turning 62 in 2005. Once that is the case, workers might be more inclined to wait for the higher benefits that would be available at a later age.

### Simulating the Impact of Rising Participation Rates

In this section, we simulate the impact of two scenarios of rising labor force participation rates (PR) through 2029 for the 65-plus population.3

The first scenario utilizes BLS labor force projections,4 which assume a labor force participation rate of 15.4 percent (18.3 percent for men and 11.7 percent for women [Table 2]) for the 65-plus population in 2029. In the second scenario, we assume that by 2029, the labor force participation rate for persons aged 65 and over will have returned to what it was in 1950, 26.7 percent.5 In both scenarios,

---

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3 The model used for these simulations does not extend beyond 2029.

4 The participation rate for 2029 is a linear interpolation from BLS projections for 2025 and 2030. See ftp://ftp.bls.gov/pub/special.requests/ep/labor.force/.

5 In 1950, age 65 was the full retirement age as well as the earliest age at which retired worker benefits could be collected. Reduced benefits at
participation rates for all other age groups are those projected by BLS.

For both scenarios, we do two separate simulations. In the first case for Scenario I (case I.a), we assume that workers who remain in the labor force beyond the normal retirement age begin to collect their Social Security benefits at the NRA. That age is gradually rising to 67, a development that is incorporated in our simulation model based on projections by the Bureau of Labor Statistics. Thus, the first case using the BLS participation rates becomes our “base scenario” or baseline (shown as case I.a, the shaded box in Chart 1). In the second case (case I.b), we also use BLS labor force projections but assume that persons who remain in the labor force delay collecting Social Security benefits until 70. Thus, as of 2029, there is a three-year difference between the two scenarios in the age at which benefits are collected.

While second scenario’s assumed labor force PR of 26.7 percent for the 65-plus population in 2029 might seem like an unrealistically steep rise from 13.1 percent over less than age 62 did not become available until 1956 for women and 1961 for men.
three decades, it would represent an increase in the participation rate for the 65-plus population of slightly less than one-half a percentage point each year. At this rate, a total of 16.7 million persons aged 65 and over would be in the U.S. labor force by 2029—about double the number under Scenario I (Figure 1).

To examine the economic impact of the rising participation rates discussed in this Issue Brief, we use the Macroeconomic Advisers LLC (MA) econometric model. This model enables us to simulate the impact of the projected increases in the labor force participation of the 65-plus population through 2029 on such outcomes as the number of Social Security beneficiaries, Social Security benefits, the Social Security trust funds, the federal budget, output and compensation per hour, and gross saving.

The MA model is a quarterly econometric model of roughly 350 equations and 140 exogenous or policy variables. The model explains entries from all major tables of the National Income and Product Accounts (NIPA), and provides details on labor and financial markets. It has an income and expenditure structure in which short-term and long-term fluctuations are caused by changes in aggregate demand.\(^6\)

**Results**

As noted above, we consider two scenarios for macroeconomic simulation. The first assumes a modest rise in the labor force participation rate for the 65-plus population through 2029 as projected by the Bureau of Labor Statistics. The second assumes that the labor force participation rate for the 65-plus population gradually returns to its 1950 rate of 26.7 percent. The baseline case (case I.a) assumes that workers collect benefits at the normal retirement age even if they continue working and paying Social Security taxes.

In case I.b, we assume that persons who are working do not receive retirement benefits until age 70; they too continue to contribute to Social Security. This resulted in four adjustments for the econometric simulations: (1) an increase in the labor force, (2) a decrease in the number of beneficiaries and hence in Social Security benefits paid, (3) an “actuarial adjustment” in the Social Security benefits (by a certain percentage depending on a person’s date of birth) if benefit receipt is delayed, and (4) additions to Social Security (FICA) tax revenues from the larger labor force.

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\(^6\) The model entails equilibrium in all six sectors of the economy: aggregate demand, financial markets, productivity and employment, wages and prices, income determination, and foreign economic activity. Equilibrium means that no sector of the economy has long-term imbalances; there are no excessive shortages or surpluses, only seasonal fluctuations.

A distinguishing characteristic of the MA model is that the equilibrium properties of all key behavioral equations are derived from the neoclassical paradigm, imparting to the model both monetarist and supply-side characteristics in the long run.
A weakness of the MA model is that it lacks full-time/part-time employment data by age group. Our simulation therefore assumes that the percentage of full- and part-time workers in the population aged 65-plus follows the same mix of full-time and part-time workers in the total employed population 16 years and older. Since older workers are far more likely than the total workforce to be employed part-time—a difference that may narrow in the future but is likely to persist—this assumption results in higher earnings and FICA contributions than would occur if age-specific work schedules were able to be used.

Social Security Benefits

As noted, the MA model incorporates the increase in the older labor force as projected by BLS, so scenario I required no labor force adjustments. Therefore, Social Security benefits paid at the NRA, as in the first set of simulations (case I.a), is our MA baseline. Under this scenario, Social Security benefits would amount to $511 million in 2005 (4 percent of GDP), $659 million in 2010 (3.9 percent of GDP), $1.2 trillion in 2020 (4.4 percent of GDP), and $2.4 trillion in 2029 (5.3 percent of GDP).

**Scenario I.b. (BLS projections for the 65-plus population; benefits paid at age 70).**

First, we discuss what happens if benefits are delayed until age 70 (case I.b), comparing that to the baseline. In case I.b, we find that delayed benefit receipt would affect the Social Security system in two ways. First, the number of beneficiaries would be 3.2 million lower than the baseline in 2010, 4.8 million lower in 2020, and 5.4 million lower in 2029. Second, Social Security outgo would be reduced because fewer people would be receiving benefits between the NRA and age 70. As a result, Social Security benefit payments would be 5.7 percent lower than the baseline in 2010, 6.6 percent lower in 2020, and 7.7 percent lower in 2029 (Figure 2). Social Security benefits as a percent of GDP would be only 3.7 percent in 2010, 4.2 percent in 2020, and 5.0 percent in 2029 (Figure 3).

---

7 In the base scenario, Social Security benefit payments are $402 billion in 2000, $659 billion in 2010, $1.2 trillion in 2020, and $2.4 trillion in 2029.
beneficiaries, if Social Security is delayed until age 70 (case II.b), is expected to shrink by 3.2 million in 2010, nearly 5.4 million in 2020, and almost 6.8 million in 2029 (not shown here). This would reduce Social Security benefits from the baseline amount by 13 percent in 2010, 18 percent in 2020, and almost 27 percent in 2029. Benefits would amount to 4.2 percent of GDP instead of 5.3 percent in 2029 (Figure 3). However, if the participation rate were to return to the 1950 level but benefits were paid at the NRA (case II.a), savings would be 19 percent below baseline in 2029, and benefits would amount to 4.6 percent of GDP (see Figures 2 and 3).

Trust Funds

The Old-Age and Survivors Insurance and Disability Insurance (OASDI) trust funds are affected in two key ways in our simulations. First, as the labor force participation rate goes up, the additional workers in the labor force increase the labor supply, and a larger pool of workers pays FICA taxes, which increases the trust funds. Second, additional workers in the labor market would increase the supply of labor and hence, other things remaining unchanged, put downward pressure on wages. The lower wages in the economy would not only reduce production costs and prices but also reduce the FICA tax contributions to the trust funds. The first effect, the rise in the number of workers, would increase the trust funds, while the second effect, reduced wages, would reduce them.

---

8 The authors are aware that the actuarial adjustment for delaying retirement beyond the NRA increases individual Social Security benefit payments. But this increase, when multiplied by a larger decline in the number of beneficiaries, is not large enough to offset the overall savings in total benefit payments. There are other spillover effects of delayed retirement, such as the larger labor force, lower prices, increased tax revenue, and increased productivity growth, which also contribute to the growth of the trust funds.

9 Which effect would predominate would depend on whether the FICA revenue or the wage cost is more elastic with respect to additions in labor force. If the revenue is more elastic, the first effect would be larger than the second.

Scenario I (BLS projections for the 65-plus population). When all factors are combined, the trust funds under the scenario using BLS projections for the 65-plus population—if Social Security benefits are paid at age 70 (case I.b)—would be 6 percent higher than baseline in 2010, 9 percent higher in 2020, and almost 14 percent higher in 2029 (Figure 4).

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Figure 4: Percent Increase Over Baseline in the Social Security Trust Fund

Source: MA Model Simulations

Scenario II (Return to 1950 participation rate for the 65+ population). In the case of the return to the 1950 PR for the 65-plus population with benefits paid at age 70 (case II.b), the trust funds would be 7 percent larger than baseline in 2010 and 18 percent larger in 2029. If workers collect benefits at the NRA (case II.a), the increases would be smaller: 1.4 percent over baseline in 2010, and 3.5 percent and 5.7 percent in 2020 and 2029 respectively (Figure 4).

Although long-term interest rates are highly speculative, the MA model projects that the trust funds, including the interest income (not shown here), would rise by $2.1 trillion and $2.8 trillion respectively by 2029, depending
on whether benefits are paid at the NRA or at age 70. However, at the BLS participation rate, the projected increase would be smaller, $894 billion, if benefits are paid at age 70.\textsuperscript{10}

The growth in the trust funds as a percent of GDP is also noteworthy (Table 3). The baseline trust fund is about 10 percent of GDP in 2000; it may equal 35 percent in 2029. If we return to the 1950s PR with benefits paid at NRA (case II.a), the funds might increase over baseline by only three-tenths of one percentage point in 2010, by 2.5 percentage points in 2020, and by 4.8 percentage points in 2029.

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<tbody>
<tr>
<td></td>
<td>NRA Age 70</td>
<td>NRA Age 70</td>
<td>NRA Age 70</td>
</tr>
<tr>
<td>2000</td>
<td>9.9</td>
<td>10</td>
<td>9.9</td>
</tr>
<tr>
<td>2005</td>
<td>16</td>
<td>16.6</td>
<td>16.3</td>
</tr>
<tr>
<td>2010</td>
<td>21.8</td>
<td>23.2</td>
<td>22.6</td>
</tr>
<tr>
<td>2015</td>
<td>28.4</td>
<td>30.9</td>
<td>30.4</td>
</tr>
<tr>
<td>2020</td>
<td>33.1</td>
<td>36.6</td>
<td>35.7</td>
</tr>
<tr>
<td>2025</td>
<td>34.9</td>
<td>39.5</td>
<td>38.7</td>
</tr>
<tr>
<td>2029</td>
<td>35</td>
<td>40.4</td>
<td>39.8</td>
</tr>
</tbody>
</table>

Source: MA Model Simulations

On the other hand, if benefits are delayed and greater numbers of workers remain in the labor force until age 70 (case II.b), the funds might rise almost 10 percentage points above the baseline in 2029. However, at the PR projected by BLS with benefits delayed to age 70 (case I.b), funds might be 5 percentage points higher than the baseline in 2029. Thus, returning to the 1950 labor PR alone does not increase the trust funds as much as raising the age at which benefits are collected.

\textsuperscript{10} Our projection of the interest income on the trust funds is higher than the Social Security Trustees’ projections in out years (Social Security Administration, 2002). The MA model follows the Congressional Budget Office’s assumption on the long-term interest rates, whereas the Trustees assume a fixed 6 percent interest rate.
in labor supply would be accompanied by an increase in capital, the labor compensation per hour would depend upon two opposing factors: an increase in labor productivity would raise it, while an increase in labor supply would decrease it. Our model suggests that real compensation per hour would decline 2 percent at the BLS rate if benefits are paid at 70, 12 percent at the 1950 PR if benefits are paid at the NRA, and 14 percent at the 1950 participation rate if benefits are paid at age 70. Compensation per hour declines more under Scenario II, as greater numbers of workers are added to the labor force because of the higher labor participation rate.

Despite a decline in output and compensation per hour, there would be little change in the unemployment rate (not shown here). The model projects that the civilian unemployment rate would rise or fall by no more than two-tenths of a percentage point over the base scenario when the employment in transition is adjusted with the market wage rate. The assumption of flexible wages in the MA model implies that additional workers are absorbed in the economy, thereby avoiding structural unemployment.

### Gross Saving Rate

Savings are important to finance economic growth. When more men and women are added to the workforce, additional capital is required to generate employment in the economy. If the labor PR increases at the BLS rate and benefit payments are delayed to age 70, the gross saving rate\(^\text{12}\) would increase by only 1.8 percentage points over the baseline in 2029 (case I.b). It would increase by 7.9 percentage points under case II.b, a return to the 1950 PR and benefits delayed to age 70 (Figure 7).

The gross saving rates, being endogenous to the model, are higher for several reasons: (1) real disposable income rises over time; (2) both consumer prices and producer prices decline as a result of falling wage rates; and (3) government saving rises due to rising off-budget federal surpluses.

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\(^\text{12}\) Gross saving equals personal saving plus business saving plus government saving. The gross saving rate is the ratio of gross saving to gross national product (gross domestic product plus net foreign trade).

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11 Productivity gains are augmented by an increase in capital stock (both capital deepening and capital widening) resulting from rise in gross savings (see Figure 7).
Disposable Income Per Capita and Inflation

Although 2029 wages and salaries in nominal dollars are expected to decline by 0.5 percent (BLS projections) and by 6.6 percent (at the 1950 PR) over the baseline, real disposable personal income at the 1950 PR, as can be seen in Figure 8, is expected to rise by 4.3 percent at the normal retirement age (5.4 percent if retirement benefits are delayed until age 70). This is because of (1) lower production costs, due to lower wage costs and partly to the rise in productivity, and (2) an inflation rate lower by as much as 1.5 percent in Scenario I and 7 to 8 percent in Scenario II (Figure 9).

Conclusion

The economic simulations discussed in this Issue Brief show the impact of an increased labor force participation rate for the 65-plus population and delayed receipt of Social Security retired worker benefits. They reveal a positive impact of increased labor force participation on macroeconomic variables. A return to the 1950 labor force participation rate for persons 65 and older would strengthen the Social Security trust funds. A larger workforce due to a higher participation rate contributes to productivity growth and does not cause spurts of unemployment. While the simulations project a lower wage growth, the lower growth rate simply means that wages will not grow as rapidly as they might otherwise have grown; it does not mean they will fall. Slower growth should not be unacceptable if real disposable personal income and real consumption increase over time.
A return to a 1950s PR for the older population would not necessarily require any change in current policy. As discussed earlier in this Issue Brief, there are several reasons why workers might on their own decide to postpone retirement (and receipt of Social Security benefits) until age 70. However, public and private sector policy initiatives might help, with a potentially beneficial impact on the trust funds. If the participation rate for the 65-plus population returns to its 1950s level and if workers do not receive any benefits until 70, the OASDI trust funds could increase by $2.3 trillion in 2029. It is worth noting that increasing labor force participation alone does not add to trust fund balances as much as does delaying Social Security benefits.

If opinion polls are any guide, the public is not receptive to the prospect of a higher retirement age for full Social Security benefits. Requiring people to work longer for those benefits also presumes an adequate supply of suitable jobs for older workers, workers with the skills employers need, employer receptivity to hiring and/or retaining older workers, and a viable safety net for those who, for whatever reason, cannot remain in the labor force until the new NRA. Encouraging workers to postpone retirement and providing them with attractive opportunities to do so, however, is another matter and seems inevitable in the face of the changing age composition of the population.

Population projections for the United States (Figure 10) highlight the extent to which employers are likely to face shortages of younger workers as the population ages.14 Boomers, who provided a seemingly endless supply of younger workers in the 1970s and 1980s, may be needed to supply sufficient numbers of workers to ensure economic growth. If that is the case, employers will have the incentive to provide a wide range of attractive employment opportunities that could foster a sizable voluntary increase in labor force attachment at upper ages.

![Figure 10: Percent Change in Population 16+ by Age Group, 2000-2015](image)


Technical Appendix

As mentioned in the text, the Macroeconomic Advisers econometric simulation model is a general equilibrium model that attains equilibrium in all sectors of the economy simultaneously. The monetary sector of the model allows various options, such as either the real or nominal federal funds rate, or the nominal money supply, or the supply of non-borrowed reserves to be exogenous. The model also has a Social Security module (especially designed as a long-term model for AARP) that simulates trust funds, interest

13 Workers might be more inclined to postpone retirement for some time after reaching the early retirement age (ERA). Increases after that age up to the NRA would have no impact on lifetime benefits; however, workers would still be contributing to the Social Security system. Continued employment could have other positive effects as well. Because of the complexity of the MA model, this Issue Brief focused only on increased participation after reaching the NRA. At some point, it might be worth simulating the impact of increases after the ERA as well.

14 This will be the case in other developed countries as well.

Raising the labor force participation rate and delaying benefits affect both contributions and outlays. In the MA model framework, the increases in OASDI in period “t” can be written as follows:

(1) \[ \text{OASDI}_t - \text{OASDI}_{t-1} = \text{Contributions}_{t-1} - \text{Outlays}_{t-1} \]

where the contributions are determined by multiplying the Social Security contribution (FICA) rate by the current wage and salary income (YWS) of workers, i.e.,

(2) \[ \text{Contribution}_t = \text{FICA}_t * \text{YWS}_t. \]

The total wage and salary income is determined by the hourly compensation multiplied by total hours worked. The total hours worked depends on the labor force, which in turn, depends on the participation rate (PR). Thus,

(3) \[ \text{YWS}_t = \text{Hourly compensation, } * \text{Total hours worked,} \]

and

(4) \[ \text{Total hours worked}_t = f (\text{PR}_t, \text{population}). \]

Raising the participation rate (which increases the numbers of workers) reduces the hourly wage rate. The lower wage rate reduces the total cost of production. The lower cost of production then reduces the price level, i.e., the Consumer Price Index (CPI).

Thus, raising the participation rate not only (a) reduces the CPI and hence the cost-of-living adjustments (COLA), it also (b) reduces Social Security benefit payments. If the age of benefit receipt is also raised along with the participation rate, as was done in our simulations, the number of Social Security beneficiaries falls. That further reduces the benefit payments. Thus, combining all the effects, outlays can be written as,

(5) \[ \text{Outlays}_t = \text{SSCOLA}_t * \text{BRSS}_t * \frac{\text{Number of Beneficiaries}_t}{\text{Number of Beneficiaries}_{t-1}} \]

where BRSS is the real per capita Social Security benefit rate exogenous to the model—computed historically from the Social Security benefit payments per beneficiary deflated by the cost-of-living adjustments. The Social Security Cost-of-Living Adjustment, SSCOLA, depends on the current CPI, lagged values of CPI, and other Social Security adjustments (SSAdj). The number of beneficiaries depends upon the PR and the age at which benefits are collected.

(6) \[ \text{SSCOLA}_t = f (\text{CPI}_t, \text{CPI}_{t-s}, \text{SSAdj}_t) \]

(7) \[ \text{Beneficiaries}_t = f (\text{PR}_t, \text{Age of benefit receipt}) \]

The actuarial adjustments for delayed benefits are calibrated by BRSS. In our simulations, we used the actuarial adjustments in the current law. The net effect of raising the PR and delaying retirement benefits on outlays might appear ambiguous—raising the actuarial benefits (BRSS) on the one hand, and lowering the number of beneficiaries on the other—but the actuarial increase in benefits is not large enough to offset the decline in outlays when multiplied by a larger decline in the number of beneficiaries and a lower COLA.

Second, despite a lower compensation per hour in eq. (3), output per hour in the economy still rises because lower production costs and lower interest rates stimulate capital spending enough to raise productivity per hour. Also, assuming no change in the rate of unemployment and the tax rate, ceteris paribus, the Cobb-Douglas type of production function in the MA model would necessarily require more capital spending to absorb the additional labor supply resulting from raising the PR and delaying retirement benefits.
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