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Abstract

Workers drain national resources in two ways when they retire – they begin collecting Social Security and Medicare benefits and they stop paying federal income and payroll taxes. Policies that encourage workers to delay retirement and increase labor supply could generate more gains to individuals, the retirement system, and the economy than other types of Social Security reforms. Drawing on the Urban Institute's Dynamic Simulation of Income model (*DYNASIM3*), this report examines how delaying retirement for non-disabled workers would affect individual retiree benefits, the solvency of the Social Security trust fund, and general revenues.

The results suggest that delaying retirement by itself does not generate enough additional revenue to make Social Security solvent by 2045. That is, even if everyone delayed their retirement by five years, benefit cuts or supplementary funding sources will be necessary to achieve solvency. However, the size of the benefit cuts or tax increases could be minimized if individuals worked longer. This additional work also substantially increases worker's retirement well-being. Lower-income workers, to the extent they can work longer, have the most to gain from their additional labor. Policy changes that encourage work at older ages will substantially improve both economic and personal wellbeing in the future.

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I. INTRODUCTION

When people retire, they forgo the earnings they would typically use to finance their consumption. To replace these earnings, a number of retirees begin collecting pensions and/or drawing down their assets. The majority of retirees also begin collecting Social Security benefits. At the same time, retirees pay fewer taxes—not just payroll taxes that support Social Security, but also federal, state, and local income taxes that support other government programs. Thus, the retirement of the boomer generation, some 76 million people, is expected to have a large impact on individuals, the retirement system, and the economy. The oldest boomers will turn age 62—the age of first eligibility for Social Security benefits and the age at which the majority of retired workers elect to receive benefits—beginning in 2008. One way of relieving the economic pressures created by an aging population would be to encourage workers to delay retirement. Because people are living much longer than before, and life expectancy is expected to improve yet more, even substantial increases in years of work would leave future generations with more years of retirement on average than almost all generations living in the past. When Social Security benefits first became payable in 1940, the average worker retired at 68. To retire for an equivalent number of years in 2005 would mean retiring at 74; by 2050, that equivalent age would increase to 78. However, in 2005, workers on average retired about age 63 (Steuerle, 2005).

When people work longer they earn more income, usually save some of that income, allow existing assets to grow, increase their lifetime Social Security benefits, and increase their annual Social Security benefit even more when their lifetime benefits are withdrawn over a shorter period of time. Butrica et al. (2004) estimates that people could increase their annual consumption at older ages by more than 25 percent by simply retiring at age 67 instead of age 62.

Delaying retirement can also have a positive effect on the Social Security system. In 2004, the Social Security Old-Age and Survivors Insurance and Disability Insurance (OASDI) Trust Funds paid about $493 billion in Social Security benefits and received about $658 billion in revenue. About 84 percent of this revenue came from payroll taxes paid by employees, employers, and the self-employed. Another 2 percent came from income taxes paid on Social Security benefits, and 14 percent came from interest income on OASDI Trust Funds (Board of Trustees, 2005).

The Office of the Chief Actuary (OCACT) projects that the payroll taxes will be more than enough to pay promised benefits through 2016. However, because of the aging of the population and the retirement of the largest birth cohort in U.S. history, this income stream will become insufficient to pay promised benefits in 2017, requiring trustees to begin redeeming the bonds held by the OASDI Trust Funds. According to current projections, all of the assets in the Trust Funds will be depleted by 2041. Without reform, benefits received after 2041 will have to be paid solely out of payroll tax and the proceeds from income tax on benefits, which will fall short of benefits promised under current law (Board of Trustees, 2005). Thus, working longer would inject the Trust Funds with much-needed cash, especially from the additional payroll taxes.

What's more, workers who delay retirement produce additional goods and services for the economy and pay additional income taxes that increase general revenues that can be used to support other government programs (or, for that matter, be used to cover some of Social Security reform). At the same time, these additional revenues from a larger national income reduce tax pressures on younger workers, or, alternatively, allow government to spend more on programs other than for the elderly.

This report provides what we believe to be the first comprehensive look at how changes in retirement behavior and reforms that encourage workers to delay retirement could impact individual retiree benefits, the solvency of the Social Security Trust Funds, and general revenues. How would delaying retirement influence individual Social Security benefits in particular and retirement income and adequacy more generally? What is the differential impact by age, marital status, race, education, and income level? How much would additional work increase revenues dedicated to fund retirement benefits? What is the net impact of working an additional year on general revenues?

We answer these questions using projections of retirement age, Social Security take-up age, pensions, Social Security benefits, taxes, and other important sources of income in retirement from the Urban Institute's Dynamic Simulation of Income Model (DYNASIM3).[1] We increase the retirement and Social Security take-up age of nondisabled workers and estimate their Social Security benefits, payroll taxes, and federal and state income taxes. While the report shows the extraordinary possibilities generated by additional work, it is not a behavioral study of exactly how people would respond to existing incentives. Instead, it measures the economic consequences of delaying retirement under a range of specified behavioral responses.

[1] DYNASIM uses OCACT 2005 economic and demographic assumptions including labor force participation rates, average earnings, and mortality.

We find that the Social Security earnings generated from one additional year of work are almost equal to the entire 2045 Social Security shortfall (of benefits from taxes) projected under the baseline scenario. Also, the additional Social Security taxes generated by five years of work offset more than half of the Social Security shortfall in 2045. Furthermore, if one takes into account the additional income tax revenues, the government's gain to its unified account is far greater than the size of the Social Security deficit. While it is harder to depend upon additional work only to close the gap between projected Social Security income and outlays, various combinations of benefit cuts and additional work can still leave the average retiree with significantly higher average retirement income than he otherwise might have. The increase in personal wealth from added work more than offsets any decrease in personal wealth due to simulated Social Security benefit cuts. Under all of our simulated reform options, added work leads to a more solvent and more financially secure retirement.

II. LITERATURE REVIEW

Although numerous studies have examined how our system of taxes and transfers affects work incentives, previous research has not measured the combined impact of Social Security, taxes, and employee benefits on the returns to work at older ages. Gokhale, Kotlikoff, and Sluchynsky (2002), for example, compare lifetime earnings for a representative two-earner couple to lifetime taxes and the lifetime value of transfer payments they lose because of work, and conclude that workers give up nearly 50 cents in tax payments and foregone transfers for every dollar they earn. The authors do not, however, examine returns to work at older ages, or how returns vary with age. A number of studies have investigated the impact of financial incentives on retirement behavior, especially the role of Social Security and employer-sponsored pension and health plans (Coile and Gruber 2004; Johnson, Davidoff, and Perese 2003; Lumsdaine, Stock, and Wise 1992, 1994; Samwick 1998; Stock and Wise 1990), but they have not focused on how total returns to work change as adults age. Finally, Diamond and Gruber (1999) compute implicit tax rates and replacement rates for prototypical workers, but they ignore the role of federal income taxes and employer-sponsored pension and health insurance plans, which have important effects on work incentives.

Research by Butrica et al. (2004) attempts to fill the gap in this literature by describing the combined impact of Social Security, typical employee benefits, and the tax system on the tax rates, replacement rates, and retirement wealth of representative workers. The authors find that the implicit tax rate on work increases rapidly at older ages, and by age 65 people can typically receive nearly as

much in retirement as they can by working (see figure 1). However, the authors also find that older individuals could substantially increase their financial resources in retirement by working longer. For example, the representative worker could nearly double his real annual income at age 75, net of health insurance premiums and federal taxes, by stopping work at age 65 instead of age 55. By waiting until age 68 to retire, he would accumulate enough wealth to finance a consumption stream of $60,000 per year from age 55 onward, nearly three times as much as he could finance if he retired at age 55.

This report builds on the research of Butrica et al. (2004) in two primary ways. First, the results in this report are based on a nationally representative sample of the U.S. population, rather than on prototypical individuals. Second, this report examines the consequences of delaying retirement both at the macro and individual level, rather than just the individual level. Specifically, this report considers how additional work influences the Social Security deficit and the taxes that would go to support all government programs within a unified budget, in addition to the lifetime and annual benefit payments in Social Security.

III. INTERACTION OF SOCIAL SECURITY, PENSIONS, EARNINGS, AND TAXES

Like Butrica et al. (2004), this report accounts for the complex interaction between Social Security benefits, pensions, earnings, and taxes to assess how working longer influences individual retiree benefits, the solvency of the Social Security Trust Funds, and general revenues. In this section, we briefly describe how working longer might influence each of these income sources, as well as taxes. Butrica et al. (2004) provides more detail about the provisions of Social Security, tax law, and employer benefit policies as they pertain to the decision to work at older ages.

Working an additional year will generally increase future Social Security benefits, for example, but the relationship between work history and Social Security is complex. Social Security reduces payments for those who collect benefits before the normal retirement age (NRA) and increases benefits for those who delay collecting until after the NRA.[2] But delaying take-up also reduces the number of payments they receive. The optimal age of take-up depends in part on mortality expectations: those who survive until very advanced ages will gain more from claiming later than those who do not live as long. In addition, beneficiaries who continue to work are subject to the retirement earnings test. For those

[2] Social Security reduces benefits by 5/9 of 1 percent for each month that benefits are received before the NRA, up to 36 months. The benefit is further reduced by 5/12 of 1 percent for every month before the NRA in excess of 36. Benefits are increased by ¾ of 1 percent for each month that initial take-up exceeds the NRA, up to age 70. No credit is given for delaying initial take-up beyond age 70.

below the NRA, Social Security withholds $1 in benefits for every $2 of earnings in excess of the exempt amount—$12,480 in 2006.

Workers with defined contribution pension plans will also continue to build up the assets in these accounts through their own, and possibly their employers', contributions. In the case of defined benefit (DB) pension plans, however, additional work does not necessarily translate into higher benefits. For instance, many traditional DB plans penalize those who continue on the job after they qualify for full retirement benefits, reducing the lifetime benefits they receive from the plan. Some plans also cap the number of years of service that workers can credit toward their pensions, and others cap the share of pre-retirement earnings that the plan will replace in retirement. In addition, for every year that workers remain on the job past the plan's retirement age, they forego a year of retirement benefits. Pension wealth declines when the increase in annual benefits from an additional year of work is insufficient to offset the loss due to a reduction in the number of pension installments. Traditional DB plans, then, often introduce strong disincentives to work at older ages.

Delaying retirement increases lifetime earnings and the ability to support, and possibly increase, current and future consumption. On the other hand, the individual returns to work are somewhat reduced because workers must pay both payroll and income taxes on most of their earnings. For society as a whole, however, those additional taxes now become available for other purposes, such as covering the cost of Social Security and Medicare.

IV. METHODOLOGY

To draw out the individual and budgetary consequences of working longer, we use the Urban Institute's Dynamic Simulation of Income Model (DYNASIM3). In DYNASIM, retirement is defined as substantial, but not necessarily complete, withdrawal from the labor force. Specifically, DYNASIM's retirement age represents the age at which a worker experiences at least a 50 percent drop in earnings compared with average earnings earned between ages 45 and 50. (The drop in earnings must last for at least two years.) Defining the retirement age this way allows DYNASIM to simulate more gradual transitions to full retirement. A separate DYNASIM module projects Social Security take-up age using discrete-time hazard models based on age, expected benefit amount, spousal

characteristics, and Social Security policy parameters. (See Favreault and Smith (2004) for more detailed information).

To simulate delayed retirement, we increase the DYNASIM retirement and Social Security take-up age by one or five years. We do this for those who: 1) are not disabled, 2) did not die before the model predicted their retirement or Social Security take-up, 3) retired or took up Social Security benefits before age 70 or the end of the projection period, and 4) are still in the labor force and not collecting Social Security benefits in 1993, the first year of DYNASIM projections. For example, in the "work one more year" scenario, if DYNASIM projects a worker to retire at age 60 and to begin receiving Social Security benefits at age 62, we force the worker to retire at age 61 and to take up Social Security benefits at age 63. In the "work five more years" scenario, we force the worker to retire at age 65 and to take up Social Security benefits at age 67. We then insert the worker's pre-retirement earnings, indexed by wage growth, in each simulated extra year of work. We also shift the worker's original post-retirement earnings to reflect his or her additional work effort. After adjusting the earnings and benefit take-up age, we let the model re-estimate pensions, Social Security benefits, and federal and state income taxes.

Next we examine how increased work impacts individual retiree benefits, the solvency of the Social Security Trust Funds, and general revenues. Working longer by itself may not close the gap between projected Social Security income and outlays, and Social Security benefit changes may induce additional work. Therefore, we also experiment with alternative Social Security benefit structures. Specifically, we conduct five policy simulations that differ from Social Security current law:

- "Pure Work Effect") All non-disabled individuals delay retirement and benefit take-up and work one (or five) additional year(s). In this simulation, retirees receive Social Security benefits,

which may stay constant or increase because of a delayed retirement credit or adjustment in the retirement earnings test, over a shorter period of time.

- "Pure Benefit Cut") An across-the-board benefit cut that is unaccompanied by any change in work effort. This is represented by an increase in the Social Security NRA, which forces an actuarial reduction in the benefit at every age of retirement. While this simulation does not generate income for the Social Security Trust Funds, it does decrease costs substantially.

- "Partial Work No Benefit Cut") An increase in the Social Security early entitlement age (EEA), accompanied by an increase in the work effort of individuals who originally retired before the new EEA.[3] If the EEA increases by five years, then workers who used to retire at or before age 62 would retire five years later, those who used to retire between ages 63 and 66 would retire at age 67, and those who used to retire at age 67 or later would not change their retirement age. This simulation raises income slightly because workers who delay retirement continue to pay taxes. But it also raises costs slightly because no one receives a benefit cut, they just delay their Social Security take-up and benefits are reduced less for early retirement.

- "Partial Work With Benefit Cut") An increase in the EEA and the NRA, accompanied by an increase in the work effort of individuals who originally retired before the EEA. This is similar to the previous simulation except that it decreases costs because the increase in the NRA is essentially a benefit cut.

- "Full Work With Benefit Cut") Finally, an increase in the EEA and NRA, accompanied by an increase of similar magnitude in the work effort of all individuals. For example, if the EEA and NRA increase by one year, the work effort of all individuals, excluding the disabled, increases by one year. This simulation is identical to the previous one, but with a much larger impact since everyone is subject to it.

For each of these simulations, we examine how individual retirement annuity income and wealth, Social Security income and costs, and general revenues change compared to the baseline (no reform).

In order to analyze the change in net wealth and annual future consumption made possible by additional work, we first define total retirement wealth (TW) as the sum of Social Security wealth (SW), defined benefit pension wealth (DBPW), defined contribution account balances (DCPW), and earnings wealth (EW), less federal and state income taxes (IT) and payroll taxes (PT):

$$TW = SW + DBPW + DCPW + EW - IT - PT$$

Because we are interested in highlighting how an individual's work decision can impact his or her retirement well-being, each of these sources of wealth reflects only the wealth created by the individual. That is, we only include retired-worker benefits in the Social Security wealth calculation (i.e. we exclude Social Security auxiliary benefits), and pension wealth excludes survivors' benefits, inheritances, and benefits obtained through divorce. Each component of total retirement wealth is measured as the present discounted value (PDV) of the expected future stream of benefits or payments from age 50 until death, and then put into constant 2006 dollars. The computations assume a real interest rate of 2 percent. The measure shows net resources (from earnings, pensions, and Social Security) available to finance consumption after age 49, evaluated in the year 2006.

We also annuitize the value of retirement wealth to show how real annual consumption changes with additional work. We take the level of retirement wealth that accumulates over the individual's lifetime, and divide it by the real annuity factor at age 50. The resulting value of the annuity shows how much could be consumed every year from age 50 until death, if the retiree chose to equalize real annual consumption after age 49.[4] If retirees saved their additional wealth from working longer and annuitized *the additional amount* at retirement, their annual annuity payments would be much higher. To show this, we compute a second annuity, which is the sum of two different annuities—a baseline annuity purchased at age 50 and another purchased at the later of retirement age or Social Security take-up age. To compute the second annuity, we calculate the change in total net wealth between the baseline and alternative scenario, grow it from age 50 until the later of retirement or Social Security take-up age by a real interest rate of 2 percent, divide it by the real annuity factor that corresponds to that age, and add it to the baseline annuity.

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[3] The early entitlement age, currently age 62, is the earliest age that individuals may take up Social Security benefits. However, annual benefits are then reduced to adjust for the fact that early retirees receive benefits over a longer period.

[4] The annuity is price-indexed (inflation protected) and based on the average mortality by age, cohort, sex, race, and education. The real rate of return is 2 percent.

At the macro level, we calculate the change in the Social Security deficit and in general revenue due to additional work. To do this we aggregate Social Security benefits and revenues over all individuals in the population and compare the projected total number of OASDI beneficiaries, the total benefits that will be paid to them, the total number of covered workers, and the total general revenue (payroll and income taxes) generated by their work under the baseline and alternative scenarios. For these analyses, we include both the individual's Social Security retired-worker and auxiliary benefits to better represent the total costs to the system. We calculate the change in Medicare HI tax from additional work, but we exclude these funds in our Social Security deficit reduction calculations.

Description of DYNASIM

DYNASIM is a useful tool for gaining insights into the future retiree population and their retirement incomes.[5] The model starts with a self-weighting sample of about 100,000 individuals from the 1990 to 1993 Survey of Income and Program Participation. DYNASIM ages this starting sample in yearly increments to 2050, using parameters estimated from longitudinal data sources. The model integrates many important trends and differentials in life course processes, including birth, death, schooling, leaving home, first marriage, remarriage, divorce, disability, work, and earnings. Important for this study, DYNASIM projects retirement age and Social Security take-up age. DYNASIM also simulates the major sources of retirement income—specifically Social Security benefits, pension income, income from assets, earnings, Supplemental Security Income (SSI), imputed rental income, and income from nonspouse co-resident family members. Finally, the most recent version of DYNASIM also includes federal and state income taxes, which are calculated using the income tax calculator developed by Jon Bakija (2005). This calculator accurately models current law taxes including EGTRRA, JGTRRA, the AMT, and the taxation of Social Security benefits and pension income. (See the appendix for more detail on DYNASIM).

[5] DYNASIM has been used to simulate how potential changes to Social Security will affect the future retirement benefits of at-risk populations (Favreault and Sammartino 2002; Favreault, Sammartino, and Steuerle 2002), how annuitization affects outcomes under a Social Security system with personal accounts (Uccello et al. 2003), the potential retirement consequences of rapid work effort growth among low-wage, single mothers in the late 1990s (Johnson, Favreault, and Goldwyn 2003), the implications of recent earnings inequality patterns for future retirement income (Smith 2002), and patterns of wealth accumulation and retirement preparedness (Butrica and Uccello 2004).

V. INCREASE IN INCOME AND WEALTH FOR INDIVIDUALS

Table 1 shows net retirement wealth and its components in our DYNASIM baseline. It also describes the change in wealth due to working both one and five years longer. In our baseline scenario, retirees who survive to 2049 and are receiving Social Security benefits accumulate an average net retirement wealth of $625,976 (2006 dollars). This is the sum of $199,378 in Social Security wealth, $39,576 in DB pension wealth, $54,633 in retirement account balances (DC pensions), and $477,862 in earnings wealth, less $110,982 in lifetime federal and state income taxes and $34,491 in OASDI and HI payroll taxes. This retirement wealth could support an annual consumption stream of $26,570 per year from age 50 onward.[6]

If everyone delayed their retirement by just one year (Pure Work Effect), the average net retirement wealth would increase by $31,897 and the average annuity at age 50 would increase by $1,317 per year (5 percent). If retirees saved their additional wealth from working another year and annuitized it at retirement (e.g., 401(k) balances were left untouched until retirement), their annual annuity would increase by $2,402 per year (9 percent) compared to the baseline. When workers work an additional five years, average net wealth increases $160,992 (26 percent) compared to the baseline. Annuitized at retirement, this extra wealth would increase annual retirement income by $14,888 per year—a 56 percent increase in retirement income compared to the baseline. While average Social Security wealth and retirement account balances increase with extra work, the big gains in net wealth for the individual come from his or her additional earnings. This additional wealth also generates additional taxes that can then be used to support more government spending for the retired population or for the population as a whole.

The pure addition of extra work has a large positive impact on retirement well-being, at least as measured by income or potential consumption. We next explore the impact on net wealth when we combine extra work with some Social Security policy reform options.

Table 2 shows the change in net wealth and the annual annuity under our five reform scenarios working an additional one year and five years compared to the baseline.[7] The baseline and "Pure Work Effect" columns show the same results as in table 1.

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[6] We also ran these analyses for the cohorts born between 1964 and 1966 and found very similar results. For this reason, we present only the results of the larger sample.

[7] Appendix A2 provides more details on how the sources of net wealth change with both one year and five years of additional work.

Increasing the NRA without changing work behavior (Pure Benefit Cut) has a large negative impact on retirement wealth because it is essentially a benefit cut. With a one-year increase in the NRA and no work response, average net wealth would decline by $12,169. The average annual annuity at age 50 would fall by $515 (2 percent), and the average annual annuity at retirement would fall by $936 (4 percent) compared to the baseline. With a five-year increase in the NRA, average net wealth would decrease by over $60,000 and the average annuity at retirement would fall by 17 percent.

Next consider a delay in retirement but only by workers who originally retired before the new EEA. If the EEA were increased one year in this "Part Work No Benefit Cut" scenario, average net wealth would increase by $21,685 and pay out an annual annuity that is $882 higher or even $1,497 higher (if the additional annuity did not begin until retirement) than the baseline. If the EEA were increased five years and early retirees worked five more years, average net wealth would increase by $132,716 and the annual annuity at retirement would increase by $11,264 (42 percent). Note that what goes on here is that lifetime Social Security benefits go up (the actuarial adjustment is more than fair) a tiny bit, some workers labor for an additional year and get more earnings, there are additional savings in defined contribution plans, and there are more taxes paid on the work.

In contrast to pure benefit cuts that decrease average net wealth, benefit cuts that are accompanied by additional work actually increase average net wealth. If only early retirees worked one more year but we increased the NRA one year (Part Work and Benefit Cut), net wealth would increase $9,661. This would increase the average annuity at retirement by 2 percent. If every eligible worker changed his work behavior on top of a benefit cut (Full Work and Benefit Cut), net wealth would increase $20,016 and the annuity at retirement would increase 5 percent. Under these scenarios, workers get the wealth benefit from the extra work, but the gain is partly offset by a reduction in Social Security benefits due to the benefit cut. The more workers affected by the work change, the larger the net gain.

If we focus just on the change in annuity income at retirement under our alternate reform scenarios, it is apparent that bigger increases in work effort yield bigger gains in retirement income. Reductions in Social Security benefits reduce retirement income, but benefit cuts in conjunction with additional work will ultimately lessen the size of any benefit cut needed to achieve solvency.

Lower income workers get larger gains from additional work than do higher income workers (see figure 2). Partly because of the progressive Social Security and income tax systems, lower income workers keep a greater share of additional earnings because of lower tax rates compared to higher

income workers. Of course, since lower income workers also tend to have somewhat higher mortality rates than higher income workers, their additional earnings are spread over fewer years of remaining life. This mortality differential is captured in our calculated annuity income through education. While DYNASIM projects that the average annuity at retirement from one year of work, given no changes in Social Security policy, would increase 9 percent, workers in the bottom fifth of lifetime earnings distribution would get an average increase of 16 percent in their annuity at retirement from one year more work, and a 98 percent increase from five more years of work. Benefits from work are still large for the top lifetime earners, but only about half as large as for the lowest earners.

Not all low-income workers can achieve this gain, of course. This paper does not examine all the policy options that one may also want to enact in conjunction with efforts to increase working years. But note that the relative gains increase well up the income scale, so that even the second richest quintile has a larger percentage increase in annual income than does the richest. Of course, the gains are sizable in every quintile.

Substantial increases in work at older ages, of course, may be dependent upon some amount of policy reform. Changing the symbolism of defining 62 as old age may itself have long-term effects if people begin to realize at that age they often have one-third of their adult lives on average remaining before them. Policy reform—whether it changes symbols or incentives or both—is likely to change work behavior (although we do not examine how much in this paper). As a bottom line, however, neither the "Pure Work Effect" nor the "Pure Benefit Cut" scenarios is realistic. Rather, reforms that include both work increases and benefit cuts are a more likely outcome.

Our examination of the potential change in retirement age brings to mind two very important problems that should be addressed. First, an increase in the retirement age for some individuals means an actual loss in DB benefits under current private plan practices. These net losses for individuals in some cases generally mean an equal and opposite net gain to employers. If one believes that employees could capture these gains, then the table understates the net gains to employees; either way it understates the net gains to the economy. Second, the actuarial adjustments in Social Security are quite generous as one moves into the future—in fact, they are more than actuarially fair from a benefit standpoint. Adjustments in retirement age need to be done in a way that avoids large unintended losses by relying on old formulas for what makes actuarial sense. For example, the "Pure Work Effect" scenario not only increases taxes paid by workers, it also bumps up their average lifetime benefits.

VI. EFFECTS OF ADDITIONAL WORK ON SOCIAL SECURITY

In this section, we examine the extent to which working longer can help make Social Security solvent. To do this we aggregate Social Security benefits and revenues over all individuals in the population and compare the projected total number of OASDI beneficiaries, the total benefits that will be paid to them, the total number of covered workers, and the total payroll taxes generated by their work under the baseline and alternative scenarios.

Under the DYNASIM baseline, Social Security expenditures on benefit payments will exceed income from OASDI payroll taxes beginning in 2023 (see Figure 3).[8] By 2045, DYNASIM projects Social Security income to be $3,791 billion and costs to be $4,430 billion—a deficit of $638 billion. If everyone worked one more year (Pure Work Effect), this would reduce the deficit by 2 percent (see table 3).[9] However, working five more years (Pure Work Effect) would reduce the deficit by 29 percent, still leaving a Social Security deficit of $450 billion. Unfortunately, working longer by itself does not close the gap between projected Social Security income and outlays.[10]

Combining additional work with changes in Social Security policy has a much larger impact on the Social Security deficit than just working longer by itself. For example, if everyone delayed retirement by five years and, at the same time, both the EEA and NRA were increased by five years (Full Work and Benefit Cut), Social Security could remain solvent beyond 2049 (the last year in the projection period). The deficit in 2045 would be reduced by 159 percent to become a surplus of $377 billion. Even under the "Part Work and Benefit Cut" scenario, where not everyone delays retirement, the deficit in 2045 would be reduced by 147 percent to become a surplus of $299 billion. Increasing the NRA five years alone (Pure Benefit Cut) would achieve solvency, reducing the deficit by 138 percent to become a surplus of $243 billion in 2045.

Note that even though delaying retirement by itself (Pure Work Effect) does not close the deficit, it does reduce it by 2 percent for one more year of work and by 29 percent for five more years of work, thus requiring a much smaller benefit cut and a much higher sustainable benefit level. The Social Security earnings from one additional year of work ($568 billion) in 2045 are almost equal to the entire 2045 Social Security deficit projected under the baseline scenario. Also, the additional Social Security

[8] OCACT projects that Social Security outlays will first exceed revenues in 2017 (Board of Trustees 2005). The Congressional Budget Office projects this year to be 2020 (Congressional Budget Office 2005). Our estimates will differ from either of these sources because: 1) DYNASIM does not project children's Social Security benefits, and 2) our measure of Social Security revenue includes only payroll taxes and excludes interest and taxes on benefits.

[9] Appendix table A4 includes additional detail for both the one-year and five-year scenarios.

taxes generated by five years of work ($360 billion) are more than half of the Social Security shortfall in 2045.

Figure 4 shows aggregate income and costs to the Social Security system under the baseline and alternate scenarios assuming workers delay retirement by 5 years. As the cost to income ratio illustrates, the year of insolvency is 2023 under the baseline. It moves to 2027 under the "Pure Work Effect" scenario, to 2025 under "Part Work Effect No Benefit Cut" scenario, and beyond 2049 under all other scenarios.

VII. EFFECTS OF ADDITIONAL WORK ON GENERAL REVENUES

Additional work also increases general revenues through federal and state income taxes. While this extra revenue is not earmarked for Social Security, it does represent additional resources available to cover other government spending or to help avoid higher taxes. We add this additional revenue to our measure of deficit reduction to calculate the change in the unified deficit. If all eligible workers worked one more year (Pure Work Effect), general revenues would increase $170 billion (see table 4).[11] The extra general tax revenue combined with the $10 billion Social Security deficit reduction (from table 3) would generate $180 billion additional revenue—that is a 28 percent reduction in the baseline Social Security deficit compared to only a 2 percent reduction when the extra general tax revenue is excluded. A benefit cut without any additional work (Pure Benefit Cut) also lowers the Social Security deficit, but because it produces less income tax revenue, it reduces the total reform savings.

The impact of increased general revenues would be substantially greater if everyone delayed retirement by five years. For example, under the "Pure Work Effect" scenario the Social Security deficit would decline by 29 percent, but the unified deficit would decline by 159 percent—more than enough to pay promised Social Security benefits in 2045. In fact, accounting for the increase in general revenues, all of the five-year scenarios modeled would be solvent throughout the projection period (see figure 5).

While none of our one-year scenarios generate enough additional revenue to close the long-term Social Security deficit, all of the five-year scenarios are more than sufficient. The more we can encourage workers to delay retirement, therefore, the less we will have to reduce promised benefits to

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[10] Of course, it is possible that increasing work beyond five years may be enough to close the gap. But this policy seems unrealistic.

[11] Additional work also increases hospital insurance (HI) taxes. We do not include the additional HI revenue in our measure of revenue gains from work. The HI values are reported in appendix table A3.

achieve solvency. More work also increases retirement well-being through increased personal savings and a shorter spend-down period. The less we need to cut benefits to close the spending gap, the more we can promise in Social Security. Since Social Security is still the most important asset for most retired households, additional work goes a long way toward insuring retirees a comfortable retirement in the decades to come.

For the moment, ignore the benefits of additional earnings for the individual and look narrowly at the Social Security system by itself. At any given tax rate, additional work allows Social Security on average to pay a higher level of lifetime benefits (because there are more taxes to be shared). If people also stop increasing their number of years of benefits as their lifespans increase, then their annual benefits in retirement can be maintained at a higher rate. As a corollary, for any Social Security system with any (reformed on unreformed) tax rate, a higher average retirement age (however induced) means higher lifetime benefits and much higher annual benefits than a system with a lower retirement age.

VIII. DISCUSSION

A number of policy changes have already occurred that should encourage more work at older ages. These include the increase in the Social Security normal retirement age, the shift from defined benefit to defined contribution pensions, and the scaling back of retiree health insurance. However, these changes alone will probably not be enough. Clearly the revenue impact of additional work can significantly lessen the amount of benefit cuts that would be needed to make Social Security solvent. Any reform that increases work effort allows substantially higher levels of consumption for the population and higher Social Security benefits for retirees.

Some options to consider that would encourage work at older ages include the following:

- Change the Social Security actuarial adjustments to boost the rewards for working longer and the penalties for retiring younger—even if actuarially neutral. For instance, one could consider decreasing early Social Security benefits and increasing delayed Social Security benefits. Note that distributional issues can be met several ways, such as providing a minimum benefit, or applying this type of actuarial adjustment only for marginal benefits above some minimum (so that only retirees with higher lifetime earnings were affected).
- Increases in the benefit entitlement age for both Social Security and Medicare. Indexing the NRA and the EEA to changes in life expectancy by itself would help reverse past trends where,

because people were receiving benefits earlier and earlier relative to expected death, smaller and smaller shares of total benefits were being paid to the truly old (e.g., those in the last ten years of their lives).

- Many incentives for early retirement are outside of the Social Security system. Regulatory barriers (e.g. from the tax code, the Employee Retirement Income Security Act of 1974 (ERISA), and the Age Discrimination in Employment Act (ADEA)) discourage the offering of phased retirement. For instance, some regulations prevent workers from collecting their DB pensions while continuing to work for the plan sponsor, forcing workers to either retire or lose substantial pension wealth (Penner, Perun, and Steuerle 2002).
- The elimination of the requirement that Medicare serve as the secondary payer for workers with employer-sponsored coverage. The high cost of medical insurance for older workers discourages employers from retaining or hiring workers over age 65. Allowing Medicare (whatever the initial age of eligibility) to be the primary payer would lower employment costs and reduce the implicit tax rate faced by older workers, increasing work incentives at older ages.

XI. CONCLUSION

In previous work, we have shown that the economic pressures of an aging population can be relieved considerably for particular hypothetical workers if they can be encouraged to delay retirement. In many ways for most workers, the choice of retirement age is the most important portfolio choice they will make—far exceeding in importance such issues as whether to invest their 401(k)s in stocks or bonds. Working longer increases the net output and productivity of the economy, generates additional payroll and income tax revenue, and reduces the average number of years in which people receive retirement benefits. In this report, we have extended that previous research by demonstrating for the population as a whole just how much of a difference additional years of work can make for individual well-being, for closing the gap in the Social Security deficit, and for producing other taxes that can be used to support the government as a whole.

We find that people could increase their annual consumption at older ages by 5 percent if they worked one more year and by 25 percent if they worked five more years—assuming an annuity purchased at age 50. The gains from working longer would be even greater if retirees saved their additional wealth and annuitized it at retirement—a 9 percent increase in consumption from one more

year of work and a 56 percent increase from five more years of work. Lower-income workers gain more from additional work than higher-income workers, but all workers gain.

The Social Security earnings generated from one additional year of work are almost equal to the entire 2045 Social Security shortfall (of benefits from taxes) projected under the baseline scenario. Also, the additional Social Security taxes generated by five years of work offset more than half of the Social Security shortfall in 2045. While working an additional five years reduces the Social Security deficit, it is not enough to completely erase it. However, combining additional work with a corresponding change in the NRA means that Social Security could remain solvent beyond 2049 (the last year in the projection period). Accounting for the federal and state income taxes generated from additional work, no other changes in Social Security policy would be needed for the system to remain solvent throughout the projection period. Interpolating between the one year and five year projections suggests that if workers would increase their work over the next 45 years roughly in proportion to their increase in life expectancy, they would likely increase payroll and income taxes by enough to wipe out almost any deficit in old age insurance payments between benefit payments and Social Security taxes currently collected.[12] In this last case, we are not arguing that all those tax dollars should be devoted to Social Security, only how powerful the effect of additional work can be.

[12] According to OCACT, the life expectancy in 2004 was 74.6 years for men and 79.6 years for women (Board of Trustees, 2005). Under their intermediate assumptions, life expectancies in 2050 will increase by 4.8 years for men and 3.6 years for women.

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Table 1. Mean Baseline Respondent Wealth and Change from Additional Work ($2006)

	Baseline	Change from Baseline: Work One More Year	Change from Baseline: Work Five More Years
Social Security	$199,378	$5,937	$28,864
DB Pensions	39,576	-421	-2,517
DC Pensions	54,633	2,028	10,859
Earnings	477,862	35,579	180,658
Federal/State Income Taxes	110,982	8,736	44,157
Payroll Taxes	34,491	2,489	12,715
Total Net Wealth	625,976	31,897	160,992
Annual Annuity at Age 50	26,570	1,317	6,688
Annual Annuity at Retirement		2,402	14,888
%Change Total Net Wealth		5%	26%
%Change Annual Annuity at Age 50		5%	25%
%Change Annual Annuity at Retirement		9%	56%

Notes: Based on 17,547 unweighted observations of persons who are alive in 2049 and retired and receiving Social Security benefits.

1. Annuity at age 50 is total net wealth divided by the real annuity factor at age 50.

2. Annuity at retirement is the change in total net wealth between the baseline and alternative scenario, grown from age 50 until the later of retirement or Social Security take-up age by a real interest rate of 2 percent, divided it by the real annuity factor that corresponds to that age, and added to the baseline annuity.

Source: The Urban Institute tabulations of DYNASIM3.

Table 2. Mean Respondent Wealth and Annuity Income in 2049 Under Current Law and Estimated Change Under Alternate Reform Scenarios ($2006)

		Change Due to the Reform Compared to Baseline				
	Baseline	Pure Work Effect	Pure Benefit Cut	Part Work No Benefit Cut	Part Work and Benefit Cut	Full Work and Benefit Cut
Work One More Year						
Net Wealth	$625,976	$31,897	-$12,169	$21,685	$9,661	$20,016
Annuity at Age 50	26,570	1,317	-515	882	374	816
Annuity at Retirement		2,402	-936	1,497	554	1,449
% Change Annuity at Age 50		5%	-2%	3%	1%	3%
% Change Annuity at Retirement		9%	-4%	6%	2%	5%
Work Five More Years						
Net Wealth	625,976	160,992	-60,256	132,716	73,331	100,344
Annuity at Age 50	26,570	6,688	-2,549	5,482	2,968	4,127
Annuity at Retirement		14,888	-4,617	11,264	5,948	8,993
% Change Annuity at Age 50		25%	-10%	21%	11%	16%
% Change Annuity at Retirement		56%	-17%	42%	22%	34%

Notes: Based on 17,547 unweighted observations of persons who are alive in 2049 and retired and receiving Social Security benefits.

1. Annuity at age 50 is total net wealth divided by the real annuity factor at age 50.
2. Annuity at retirement is the change in total net wealth between the baseline and alternative scenario, grown from age 50 until the later of retirement or Social Security take-up age by a real interest rate of 2 percent, divided it by the real annuity factor that corresponds to that age, and added to the baseline annuity.

Source: The Urban Institute tabulations of DYNASIM3.

Table 3. Total Social Security Income, Cost, Social Security Deficit in 2045 by Reform Scenario (dollars in billions)

	Baseline	Pure Work Effect	Pure Benefit Cut	Part Work No Benefit Cut	Part Work and Benefit Cut	Full Work and Benefit Cut
Work One More Year						
Social Security Earnings	$30,575	$31,161	$30,575	$30,944	$30,944	$31,161
Social Security Income	$3,791	$3,864	$3,791	$3,837	$3,837	$3,864
Social Security Cost	4,430	4,492	4,250	4,511	4,309	4,317
Social Security Deficit (OASDI)	638	628	459	674	472	453
Percent Change in Deficit		-2%	-28%	6%	-26%	-29%
Work Five More Years						
Social Security Earnings	$30,575	$33,481	$30,575	$32,873	$32,873	$33,481
Social Security Income	3,791	4,152	3,791	4,076	4,076	4,152
Social Security Cost	4,430	4,602	3,548	4,652	3,777	3,775
Social Security Deficit	638	450	-243	576	-299	-377
Percent Change in Deficit		-29%	-138%	-10%	-147%	-159%

Notes: Includes all surviving U.S. residents in 2045 (146,555 unweighted observations). Social Security Earnings includes only covered earnings below the taxable maximum. Social Security income includes OASI and DI taxes. Social Security cost includes OASI and DI adult benefits.

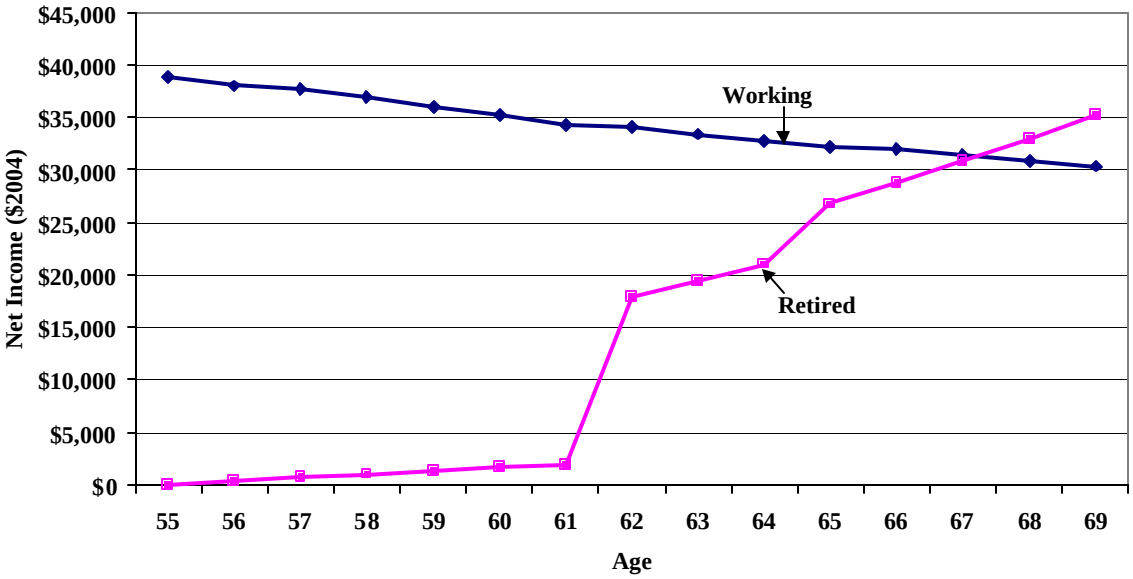
Source: The Urban Institute tabulations of DYNASIM3.

Table 4. Total Change in Income Tax, Social Security Deficit and Unified Deficit in 2045 by Reform Scenario (dollars in billions)

	Pure Work Effect	Pure Benefit Cut	Part Work No Benefit Cut	Part Work and Benefit Cut	Full Work and Benefit Cut
Work One More Year					
Increase in Income Tax	170	-23	97	69	139
Reduction in Social Security Deficit	10	180	-36	167	185
Reduction in Unified Deficit	180	157	62	236	324
Percent Change in Social Security Deficit	-2%	-28%	6%	-26%	-29%
Change in Unified Deficit as a Percent of the Social Security Deficit	-28%	-25%	-10%	-37%	-51%
Work Five More Years					
Increase in Income Tax	824	-110	610	473	684
Reduction in Social Security Deficit	188	882	63	938	1,015
Reduction in Unified Deficit	1,012	772	672	1,411	1,700
Percent Change in Social Security Deficit	-29%	-138%	-10%	-147%	-159%
Change in Unified Deficit as a Percent of the Social Security Deficit	-159%	-121%	-105%	-221%	-266%

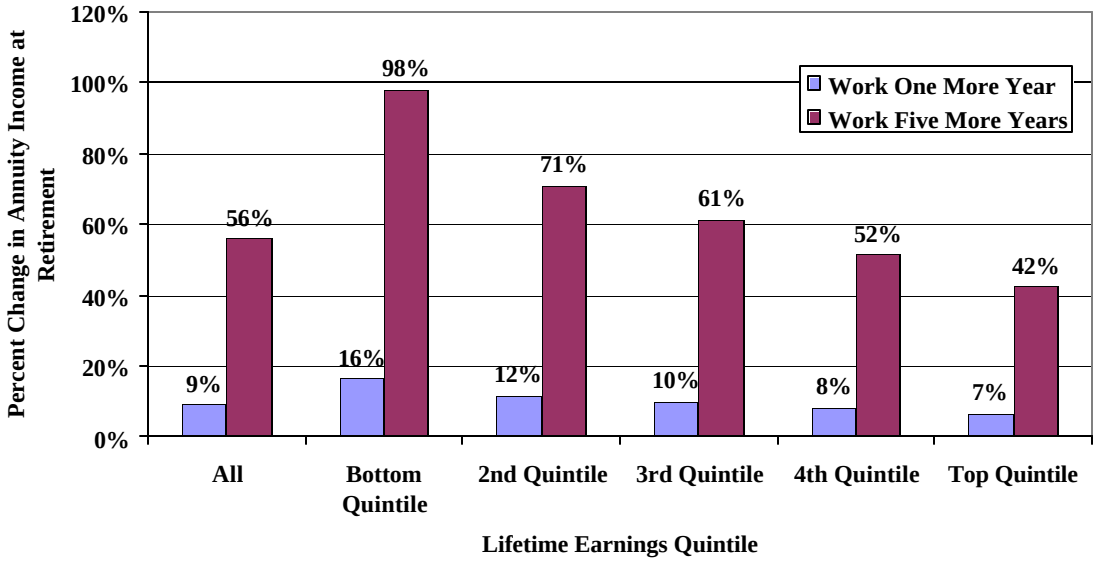
Notes: Percent change based on projected baseline Social Security deficit of $638 billion in 2045.
Includes all surviving U.S. residents in 2045 (146,555 unweighted observations).
Income tax includes both federal and state income tax.
Source: The Urban Institute tabulations of DYNASIM3.

Figure 1. Net Income of a Hypothetical Worker by Age and Employment Status



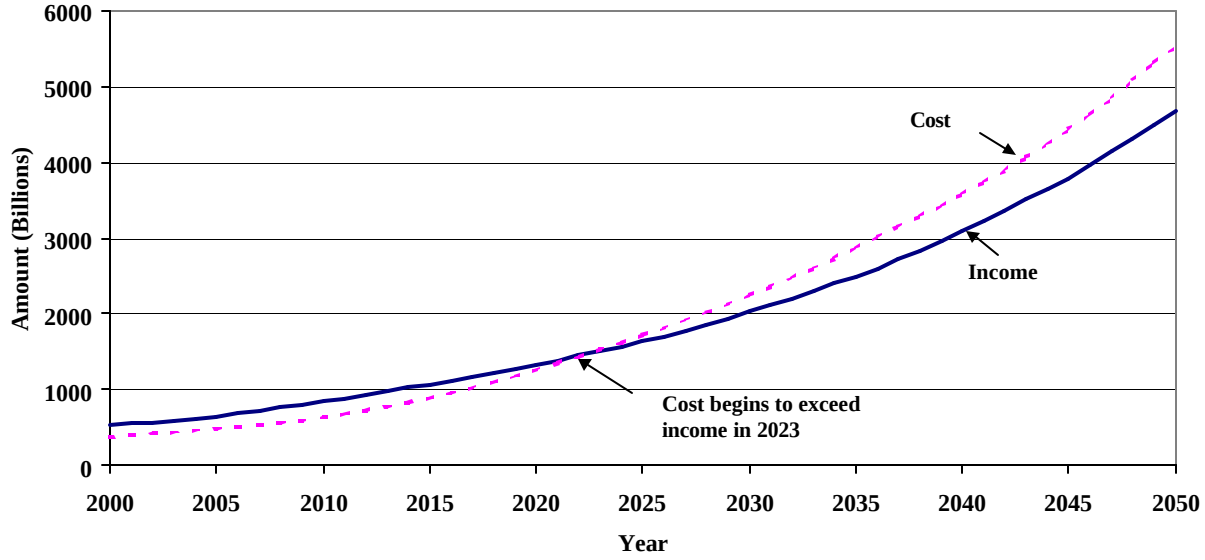
Notes: Urban Institute calculations based on a representative single male worker in good health with a DC pension plan and no retiree health insurance. Dollar amounts are in $2004. The worker makes a health insurance contribution for the employer plan while working. He buys nongroup private health insurance when retired before age 65 and a Medigap policy after age 65.
Source: Table 4 from Butrica et al. (2004).

Figure 2. Percent Change from Baseline in Average Annuity Income at Retirement by Lifetime Earnings Quintile and Additional Work Effort



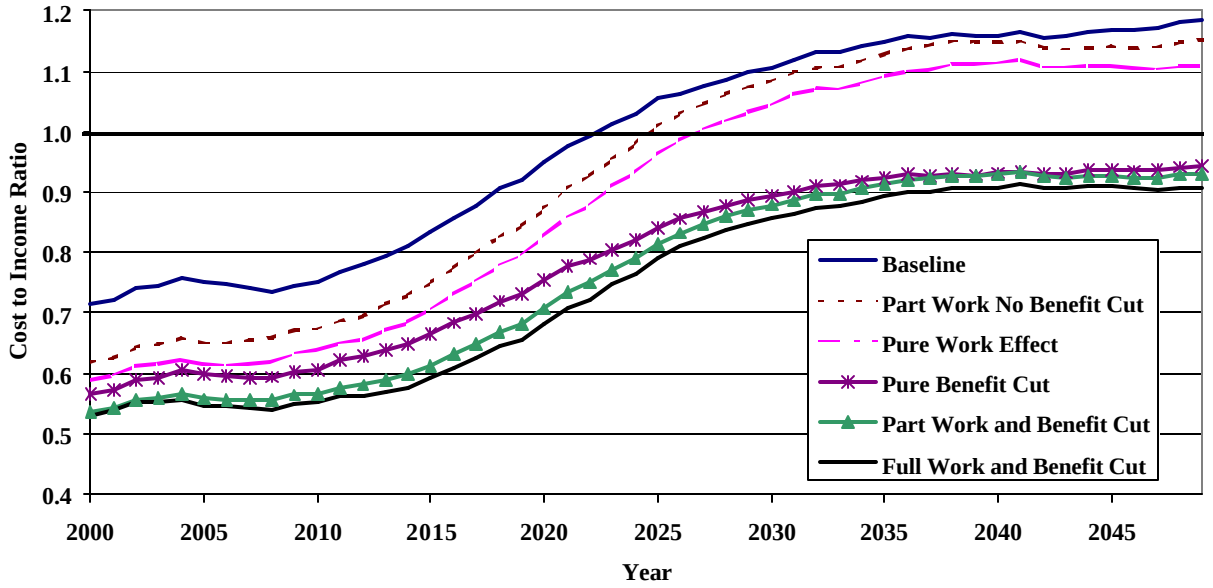
Notes: Based on 17,547 observations of persons who are retired and receiving Social Security benefits by 2049. Lifetime earnings are the average wage-adjusted individual earnings from age 22 to 62 in the baseline simulation.
Source: The Urban Institute tabulations of DYNASIM3.

Figure 3. Aggregate Income and Costs to the Social Security System, Under the Baseline, 2000 to 2050



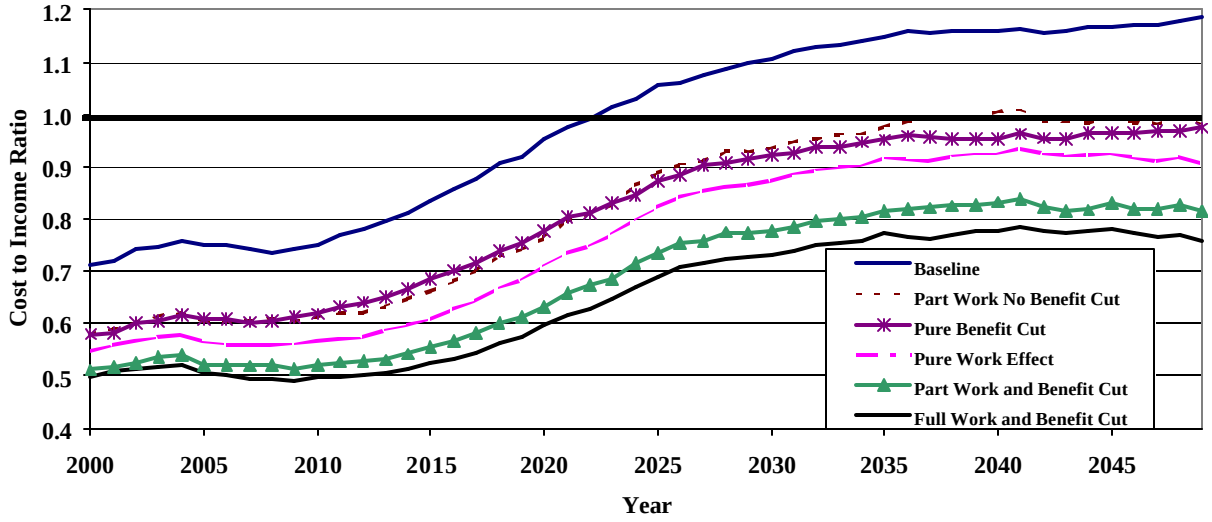
Source: The Urban Institute tabulations of DYNASIM3.

Figure 4. Social Security Cost to Income Ratio Under Various Working Five More Years Reform Scenarios, 2000 to 2049



Source: The Urban Institute tabulations of DYNASIM3.

Figure 5. Social Security Cost to Income Ratio
Under Various Working Five More Years Reform Scenarios
Including Additional Income Tax, 2000 to 2049



Source: The Urban Institute tabulations of DYNASIM3.

APPENDIX

Appendix table 1 summarizes the basic processes modeled in DYNASIM, along with the data on which the module's parameters are estimated. Favreault and Smith (2004) provide a fuller description of each of the modules used in DYNASIM. More details on the modules directly related to this report are provided below.

Sample

DYNASIM begins with a self-weighting sample of 103,072 individuals from the 1990-1993 Survey of Income and Program Participation (SIPP) data. The SIPP data provide starting values for age, sex, race, education, marital status, immigrant status, earnings, pension characteristics, financial asset, home equity, earnings, Social Security, and SSI.

Earnings

Projections of pension and Social Security wealth depend on earnings. DYNASIM has historic individual earnings from 1951 to 1992 and projected earnings from 1993 to 2050. These historical data are based on earnings records that are statistically matched from longitudinal earnings histories taken from the 1968-1994 PSID and the 1973 March Current Population Survey (CPS) matched to the Social Security Administration Summary Earnings Record.[13] Projected labor supply and earnings are based on a complex set of regressions from the PSID and the National Longitudinal Survey of Youth (NLSY) and calibrated to 2005 Social Security Office of the Chief Actuary (OCACT) assumptions about future labor force participation and wage growth.

Taxes

DYNASIM has the capacity to estimate payroll taxes, as well as state and federal income taxes. The DYNASIM tax calculator accurately models current law taxes including EGTRRA, JGTRRA, the AMT, and the taxation of Social Security benefits and pension income. The tax calculator also simulates future tax law. For short-term projections (through about 2010), it holds constant the current law tax rates and adjusts the brackets as appropriate for expected inflation. It holds the Social Security

[13] Smith, Scheuren, and Berk (2001) show that these earnings histories match up quite well with actual earnings histories that are available on a confidential basis at the Social Security Administration.

taxation thresholds at their current law values, since these are not indexed for inflation. The calculator also price indexes the provisions of the alternative minimum tax (AMT) beyond the current period, even though these provisions are not currently indexed. Without this adjustment, many middle-class taxpayers would end up paying the AMT (Burman, Gale, and Rohaly 2003). Since wages are expected to increase faster than prices, the tax calculator indexes the brackets and provisions of the AMT to wages instead of prices for the long-term projections. Doing this will avoid real-bracket creep and prevent the ratio of taxes to gross domestic product (GDP) from rising steadily over time. It also continues to hold the Social Security taxation thresholds at their current law values.

Pensions

DYNASIM projects pension amounts in defined benefit (DB) plans and defined contribution (DC) plans, as well as from IRA and Keogh plans. Pensions are based on an individual's entire work history (real and simulated) up to the projected retirement date. Baseline information regarding pension coverage on current and past jobs is based on SIPP self-reports. To impute future job changes and pension coverage on future jobs, DYNASIM incorporates data on synthetic work histories from the Policy Simulation Group's PENSIM model, developed for the Department of Labor, Pension and Welfare Benefits Administration.[14]

DYNASIM next projects pension benefits from past, current, and future jobs. In general, DB plan benefits are projected using pension plan formulas from the PBGC's Pension Insurance Modeling System (PIMS). DC account balances are projected using self-reported information on the SIPP regarding account balances and contribution rates, as well as asset allocations and future contribution rates that vary by age according to EBRI/ICI data on 401(k) asset allocations (VanDerhei et al 1999). The proportion of initial contributions and balances allocated to equities varies by age category. Then, every five years, the model re-balances the portfolios according to the allocation strategy for the individual's attained age category. Subsequent contributions are allocated to match the allocation strategy of the attained age, if different.

DYNASIM accumulates DC account balances assuming a Consumer Price Index (CPI) growth rate of 3.00 percent (the growth rate assumed by OCACT), a real rate of return for stocks of 6.50 percent, and a real rate of return for bonds of 3.30 percent. One percent is subtracted from each of the

[14] See Holmer, Janney, and Cohen (2001) for more detail on the PENSIM model.

stock and bond real rates of return to reflect administrative costs. Investment experience varies by individual and by year by setting the rates stochastically (assuming a standard deviation of 17.28 percent for stocks and 2.14 percent for bonds).

The SIPP also includes information regarding IRA/Keogh account balances and contributions. Similar to DC plans, IRA/Keogh account balances are accumulated to the retirement date, along with any new contributions and interest earnings. IRA/Keogh contribution rates are allowed to vary over time by age and earnings, using the same method used for DC plans. IRA/Keogh contributions are capped according to the legal limits that vary by year. IRA/Keogh assets are allocated the same way as DC assets and rates of return are set stochastically using the same method as that used for DC plans. Only those with IRA/Keogh coverage at the time of the SIPP interview have IRAs/Keoghs. No new IRA/Keogh participation is simulated in DYNASIM.

Social Security Benefits

DYNASIM also includes a detailed Social Security benefit calculator that uses earnings and marital histories to estimate Social Security benefits—either retired-worker, spouse, or survivor benefits. The current benefit calculator is based on the 2005 OCACT assumptions about future price and wage growth. In each year, from the projected year of first benefit receipt until the projected year of death, DYNASIM computes a respondent's Social Security benefit that reflects his or her earnings and marital history at that point in time. The calculator first establishes benefit eligibility based on personal characteristics such as age, number of covered quarters, disability status, marital status, and length of marriage. For those who qualify, the model computes Social Security benefits—either retired worker, spouse, divorced spouse, or survivor benefits. The calculator then checks an individual's take-up age against his or her NRA, reducing benefits for those who retire before their NRA and increasing benefits for those who retire later. Social Security estimates are based on the assumption that current-law benefits will be payable throughout the projection period. However, the Social Security OASDI Trust Funds are projected to be exhausted by 2041 and OCACT estimates that benefits would need to be reduced by 12.8 percent starting in 2005 in order for the trust funds to remain solvent (Board of Trustees 2005). If the benefit cuts are delayed, the average percentage reduction would need to be larger. Our Social Security wealth estimates are based on the assumption that future retirees will receive the current law benefits they were promised, not the benefits that current trust fund receipts will finance in the long run. But the model is capable of simulating the effects of alternative benefit levels.

Appendix Table 1. Summary of Core Processes Modeled in DYNASIM

Process	Data	Form and predictors
Birth	*Estimation:* NLSY (1979–94); VS; *Target:* OCACT	7-equation parity progression model; varies on the basis of marital status; predictors include age, marriage duration, time since last birth; uses vital rates after age 39; sex of newborn assigned by race; probability of multiple birth assigned by age and race
Death	*Estimation:* NLMS (1979–81); VS (1982–97); *Target:* OCACT	3 equations; time trend from Vital Statistics 1982–1997; includes socioeconomic differentials; separate process for the disabled based on age, sex, age of disability onset, and disability duration derived from Zayatz (1999)
Schooling	NLSY (1979–94), CPS (Oct. 1995)	10 cross-tabulations based on age, race, sex, and parent's education
Leaving Home	NLSY (1979–94)	3 equations; family size, parental resources, and school and work status are important predictors
First Marriage	NLSY (1979–93)	8 equations; depends on age, education, race, earnings, presence of children (for females); uses vital rates at older ages
Spouse Selection		Closed marriage market (spouse must be selected from among unmarried, opposite-sex persons in the population); match likelihood depends on age, race, education
Remarriage	VS (1990)	Table lookups, separate by sex for widowed and divorced
Divorce	PSID (1985–93)	Couple-level outcome; depends on marriage duration, age and presence of children, earnings of both spouses
Labor Supply and Earnings	*Estimation:* PSID (1980–93); NLSY (1979–89); *Target:* OCACT (LFP, wage/price growth)	Separate participation, hours decisions, wage rates for 16 age-race-sex groups; all equations have permanent and transitory error components; some wage equations correct for selection bias; key predictors include age splines, marital status, number and ages of children, job tenure, education level, region of residence, disability status, schooling status, unemployment level, and age spline–education-level interactions
Disability	SIPP (1990)	Separate entry (by sex)/exit (pooled) equations; include socio-economic differences (education, marital status, earnings history)
DI Take-up	SIPP (1990–93)	2 separate equations (by sex) predict take-up of those eligible for disabled worker benefits (ages 19 though the normal retirement age); key predictors include age, disability status, education, marital status, recent earnings

Appendix Table 1. Summary of Core Processes Modeled in DYNASIM

Process	Data	Form and predictors
Pensions (DB, DC, IRAs, Keoghs)	BLS (1999-2000); EBRI/ICI; SIPP (1990–93); PENSIM (PSG) and PIMS models (PBGC)	Uses SIPP self-reports on past and current pension coverage with job changes and future coverage simulated using PENSIM; uses PIMS for DB formulas (with separate procedure for DBs from government jobs); DC balances projected using SIPP self-reports of account balances and contribution rates and EBRI/ICI data asset allocations and contribution rates for new participants
Wealth	PSID (1984–94); SIPP (1990–93)	4 random-effects models for ownership/value given ownership separately for housing and non-housing wealth; additional models for spend-down after first OASDI receipt; key predictors include age, race, marital status, family size, birth cohort, dual-earner status, pension coverage, recent earnings
OASI Take-up	SIPP (1990–93)	Eligibility is deterministic; 3 separate equations (separate for workers by lagged earnings, and auxiliary beneficiaries) predict take-up of those eligible for retired worker benefits (ages 62 and older); key predictors include age, disability status, education, marital status, recent earnings, pensions, lifetime earnings, and spouse characteristics; take-up of survivor benefits at 60 and 61 is deterministic (i.e., mandatory if earnings are below the exempt amount)
OASDI Benefits	Rule-based	Sophisticated calculator incorporates entire work and marriage histories, auxiliary benefits for spouses/survivors and former spouses, and the retirement earnings test.
SSI Benefits	SIPP (1990–93)	Eligibility is deterministic; 2 equations predict take-up of the aged; key predictors include demographics, state supplement, resources
Living Arrange-ments of the Aged	SIPP (1990–93)	Logistic regression that considers health, resources, and kin availability (number of children ever born); resources of co-residing family members are imputed using donor families sampled from current co-residing aged individuals in SIPP.
Immigra-tion	PUMS 1980, 1990, 2000. INS yearbook 2001.	Add target number of immigrants based on Dowhan and Duleep (2002), which are based on sex, country of origin, and age at immigration

Abbreviations: BLS = Bureau of Labor Statistics; CPS = Current Population Survey; EBRI = Employee Benefits Research Institute; DB = defined benefit; DC = defined contribution; DI = Disability Insurance; ICI = Investment Company Institute; INS = U.S. Immigration and Naturalization Service; LFP = labor force participation; NLMS = National Longitudinal Mortality Study; NLSY = National Longitudinal Survey of Youth; OASDI = Old-Age, Survivors, and Disability Insurance; OCACT = Office of the Chief Actuary intermediate assumptions; PBGC = Pension Benefit Guarantee Corporation; PIMS = Pension Insurance.

Table A2. Mean Respondent Wealth and Annuity Income in 2049 Under Current Law and Estimated Change Under Alternate Reform Scenarios ($2006)

	Baseline	Pure Work Effect	Pure Benefit Cut	Part Work No Benefit Cut	Part Work and Benefit Cut	Full Work and Benefit Cut
Work One More Year						
Social Security	199,378	205,315	185,796	203,055	189,563	191,804
DB Pensions	39,576	39,155	39,576	39,550	39,550	39,155
DC Pensions	54,633	56,661	54,633	55,760	55,760	56,661
Earnings	477,862	513,441	477,862	501,860	501,860	513,441
Federal/State Income Taxes	110,982	119,718	109,569	116,438	114,970	118,089
Payroll Taxes	34,491	36,981	34,491	36,126	36,126	36,981
Total Net Wealth	625,976	657,873	613,807	647,661	635,637	645,991
Annual Annuity at Age 50	26,570	27,887	26,056	27,452	26,944	27,386
Annual Annuity at Retirement		28,972	25,635	28,067	27,124	28,020
Percent Change in Net Wealth		5.1%	-1.9%	3.5%	1.5%	3.2%
Change Total Net Wealth		31,897	-12,169	21,685	9,661	20,016
Change Annual Annuity at Age 50		1,317	-515	882	374	816
Change Annual Annuity at Retirement		2,402	-936	1,497	554	1,449
Work Five More Years						
Social Security	199,378	228,242	132,816	222,480	154,651	158,694
DB Pensions	39,576	37,060	39,576	40,610	40,610	37,060
DC Pensions	54,633	65,492	54,633	62,095	62,095	65,492
Earnings	477,862	658,520	477,862	623,259	623,259	658,520
Federal/State Income Taxes	110,982	155,139	104,676	145,156	136,712	146,239
Payroll Taxes	34,491	47,207	34,491	44,596	44,596	47,207
Total Net Wealth	625,976	786,968	565,720	758,692	699,307	726,320
Annual Annuity at Age 50	26,570	33,258	24,021	32,052	29,538	30,698
Annual Annuity at Retirement		41,458	21,953	37,834	32,518	35,563
Percent Change in Net Wealth		26%	-10%	21%	12%	16%
Change Total Net Wealth		160,992	-60,256	132,716	73,331	100,344
Change Annual Annuity at age 50		6,688	-2,549	5,482	2,968	4,127
Change Annual Annuity at Retirement		14,888	-4,617	11,264	5,948	8,993

Notes: Based on 17,547 unweighted observations of persons who are alive in 2049 and retired and receiving Social Security benefits.
1. Annuity at age 50 is total net wealth divided by the real annuity factor at age 50.

2. Annuity at retirement is the change in total net wealth between the baseline and alternative scenario, grown from age 50 until the later of retirement or Social Security take-up age by a real interest rate of 2 percent, divided it by the real annuity factor that corresponds to that age, and added to the baseline annuity.
Source: The Urban Institute tabulations of DYNASIM3.

Table A3. Aggregate Impact of Working One and Five Years Longer on Social Security and General Revenues (Population in Millions and Amounts in Billions)

	Baseline	Pure Work Effect	Pure Benefit Cut	Part Work No Benefit Cut	Part Work and Benefit Cut	Full Work and Benefit Cut
Work One More Year						
Total Population	369	369	369	369	369	369
Covered Worker Population	188	191	188	190	190	191
Retiree Population	85	82	85	84	83	82
Total Earnings	32,284	32,929	32,284	32,706	32,706	32,929
Taxable Earnings	30,575	31,161	30,575	30,944	30,944	31,161
OASI Tax	3,241	3,303	3,241	3,280	3,280	3,303
DI Tax	550	561	550	557	557	561
Total OASDI Tax	3,791	3,864	3,791	3,837	3,837	3,864
Total HI Tax	887	904	887	897	897	904
Total Income Tax	8,438	8,608	8,414	8,535	8,507	8,577
Total Revenue (OASDI+DIncome Tax)	3,791	4,034	3,768	3,935	3,906	4,003
Total Benefits	4,430	4,492	4,250	4,511	4,309	4,317
Social Security Deficit (OASDI Tax)	638	628	459	674	472	453
Social Security Deficit (Total Revenue)	638	458	482	577	403	314
Work Five More Years						
Total Population	369	369	369	369	369	369
Covered Worker Population	188	203	188	199	199	203
Retiree Population	85	71	84	74	73	70
Total Earnings	32,284	35,454	32,284	34,823	34,823	35,454
Taxable Earnings	30,575	33,481	30,575	32,873	32,873	33,481
OASI Tax	3,241	3,549	3,241	3,485	3,485	3,549
DI Tax	550	603	550	592	592	603
Total OASDI Tax	3,791	4,152	3,791	4,076	4,076	4,152
Total HI Tax	887	971	887	953	953	971
Total Income Tax	8,438	9,262	8,328	9,047	8,911	9,122
Total Revenue (OASDI+DIncome Tax)	3,791	4,976	3,681	4,686	4,549	4,836
Total Benefits	4,430	4,602	3,548	4,652	3,777	3,775
Social Security Deficit (OASDI Tax)	638	450	-243	576	-299	-377
Social Security Deficit (Total Revenue)	638	-374	-133	-34	-773	-1,061

Notes: Includes all surviving U.S. residents in 2045 (146,555 unweighted observations).

Total Revenue includes OASI, DI, and the change in federal and state income tax. HI tax is not included.

Source: The Urban Institute tabulations of DYNASIM3.

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