CENTER for RETIREMENT RESEARCH at BOSTON COLLEGE

MEASURING SOCIAL SECURITY PROPOSALS BY MORE THAN SOLVENCY: IMPACTS ON POVERTY, PROGRESSIVITY, HORIZONTAL EQUITY, AND WORK INCENTIVES

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Abstract

As interest in proposals to restore Social Security solvency rises, it's timely to examine whether current policy analyses provide adequate information on important distributional questions. This project explores measures of changes in Social Security benefits' adequacy, horizontal equity, and efficiency under different proposals. We apply the measures to simulation output from the Urban Institute's Dynamic Simulation of Income Model under the National Commission on Fiscal Responsibility and Reform Social Security proposal. A series of exhibits illustrates how they work and could inform policymakers about the relative merits of varied options to restore the program's long-run solvency and meet other objectives.

Introduction

Although a number of measures are commonly used to evaluate Social Security proposals, they are often somewhat limited. Actuarial and microsimulation models routinely show actuarial balance, average or median benefits, replacement rates at retirement, and ratios of lifetime benefits to lifetime taxes. Identifying who wins and loses under alternative policies at a point in time – for example by lifetime earnings quintile – has also become commonplace in dynamic microsimulation analyses of changes to the Old-Age, Survivors, and Disability Insurance program (OASDI).[1]

Often lacking, however, is a more complete, nuanced discussion of how Social Security benefits change relative to targeted objectives, such as enhancing adequacy for those with the greatest economic need, reducing the unequal treatment of dual- as opposed to single-earner couples with the same earnings, and improving work incentives for dually entitled and longer-term workers. For example, some studies that primarily address Social Security adequacy or equity issues show winners and losers from a benefit change, without providing a good sense of how much need is reduced or whether losers include those the system currently favors. Do we care, for instance, about whether women gain, relative to men, or is the issue whether lower-income individuals, who might disproportionately be women, gain? Similarly, should we care about whether a proposal increases the equality of treatment of those in equal circumstances – a change that may increase overall shares winning and losing?

When it comes to objectives, public finance principles suggest that programs generally should be target efficient. Within a Social Security context, this generally means that benefits should be distributed in an actuarially fair manner, except when some specific target such as progressivity is sought.[2] Some efforts are more administrable than others, and some create problematic incentives, further complicating matters.[3]

Distributional analyses of Social Security are extremely complex, partly because of the ways the program combines mandated saving and redistribution within and across cohorts (Burkhauser and Warlick 1981). While understanding how benefits will change at a point in

[1] We use the terms Social Security and OASDI interchangeably throughout this report.
[2] For instance, it would not be fair or efficient to distribute money only to everyone living in poorer cities and states even if such an effort was progressive.
[3] For example, an annual income tests ignore whether a person's income is low because he or she can't work or he or she stopped working. As a result Social Security generally uses lifetime (rather than annual) earnings as the basis for redistribution.

time under a particular proposal is useful, placing these changes in the lifetime context is also important. Most workers pay Social Security payroll taxes for several decades, and then collect benefits for many years. While in retirement, they may pay personal income taxes on their benefits if their incomes exceed designated thresholds. Comprehensive analyses need to account for both the tax and benefit sides of Social Security. The fact that the U.S. Social Security program is currently underfunded exacerbates this complexity. Frequently analysts compare systems in equal balance (in budget parlance, they compare deficit neutral systems), but what those balanced alternatives should be, especially over decades, is unclear.[4]

This paper explores and develops a series of measures that we then apply to simulation output from the Urban Institute's Dynamic Simulation of Income Model (DYNASIM) under current law and an alternative, the proposal of the National Commission on Fiscal Responsibility and Reform (henceforth NCFRR, commonly known as the Simpson-Bowles Commission). Using these two laws for illustration, we show how some provisions aimed usually at redistributing benefits have spillover effects into some aspects of horizontal equity.[5] We also document how sensitive conclusions about distributional impacts are to analysts' choices about how to compute different measures (for example, by comparing individual and household, or "shared," measures and comparing projections with and without the NCFRR proposal's half benefit).

Our paper is organized as follows. We begin by describing Social Security law and the NCFRR proposal. Next, we describe our approach and model. We then examine the literature on Social Security outcome measures, first identifying complex and controversial issues. We proceed to catalogue commonly used individual- and family-level measures of adequacy, progressivity, horizontal equity, and work incentives from other literature, discussing their respective strengths and weaknesses and relationship to principles behind Social Security and criteria for reform (e.g., Steuerle and Bakija 1994, Walker 1999).[6] We consider not just simple

[4] For example, a balanced system with more taxes will show higher benefit levels on average and often for those with lower incomes, but it imposes other burdens at different points in the life course. This results in a set of different tradeoffs.

[5] When equals are not treated equally, it may simultaneously add to the costs or inefficiency of achieving any particular progressivity goal.

[6] It is often difficult to compare alternatives on the basis of a single goal (e.g., progressivity or horizontal equity). These domains frequently overlap, as we discuss further below. For example, equalizing treatment for workers who

parameter measures of outcomes, but show outcomes for various classes of the population determined by lifetime earnings, taxes paid, and other characteristics.

Exhibits 1 through 8 contain the heart of this paper: accessible measures that can be produced as part of a standard set of outputs by which to compare different OASDI proposals. In addition to discussing the measures briefly, we apply them to the NCFRR proposal as compared to current law. Finally, we close with some thoughts about how one could modestly restructure distributional analyses to raise the profile of issues beyond financial balance and attaining program solvency.

Appendices discuss additional issues. For example, Appendices I and III discuss technical matters that are important for distributional analysis, while Appendix II describes the measures that the major U.S. government forecasting agencies, most notably the Social Security Administration (SSA) and Congressional Budget Office (CBO), use in their analyses.

Social Security under Current Law: Why We Need Measures of Adequacy, Progressivity, Horizontal Equity, and Work Incentives

Social Security is the largest of all federal or state programs aimed at redistributing income. The program paid benefits to almost 55.9 million people in March 2012. Academic and policy literature has extensively documented its importance to U.S. families, including retirees and disabled workers, and the public frequently expresses support for the program (for example, Reno and Lavery 2009). It accounts for a large share of older Americans' income, with especially important effects for those in the bottom of the income distribution (Social Security Administration 2012b). Program benefits are estimated to keep millions of recipients out of poverty (Van de Water and Sherman 2010).

Social Security, of course, affects households' incomes through both taxes and benefits. Covered workers make payroll contributions of a flat 6.2 percent, and their employers pay an equal amount.[7, 8] They make contributions on earnings only up to a ceiling, set at $110,100 in 2012. In most years, the majority of Americans pay more in payroll taxes (mostly Social

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work 40 years at $35,000 relative to those who 35 years at $40,000 could both improve fairness and increase work incentives.

[7] Temporary payroll tax reductions (aimed at promoting economic growth) were in effect last year (2011) and in 2012. The 6.2 percent rate does not include payroll contributions toward Medicare.

[8] A small share of the workforce is not currently covered by Social Security. These include some state and local workers, federal workers first hired before 1984, railroad workers, and some students. Self-employed workers make both the employer and employee contributions to Social Security.

Security, but also including HI and unemployment insurance contributions) than they pay in personal income tax.[9]

In return for these contributions, workers with sufficient work experience (typically 40 covered quarters, or about 10 years) are eligible for benefits from Social Security. Benefits are based on the highest 35 years of a worker's indexed earnings (fewer for workers becoming disabled early in life) and are paid according to a progressive formula (see figure 1).[10] As the figure shows, Social Security replaces 90 percent of average indexed monthly earnings (AIME) through the first bend point ($767, or $9,204 annually, in 2012), 32 percent of earnings between the first and second bend points ($4,624, or $55,488 annually, in 2012), and then 15 percent of earnings above the second bend point.

Workers who claim benefits when they reach their full retirement age – 65 to 67 depending on one's year of birth – receive the full Primary Insurance Amount (PIA) resulting from the progressive formula. Workers who claim their retirement benefits early – between ages 62 and their full retirement age – receive lower benefits to compensate for the greater number of payments that they can expect to receive. Disabled worker benefits are not subject to actuarial reductions for early benefit claiming. Those retired workers who defer payment until after the full retirement age may be eligible for delayed retirement credits.[11]

Dependents and survivors of retired and disabled workers may also be eligible for benefits if their marriage meets certain criteria.[12] Since these benefits do not require workers to pay any additional tax or take any actuarial reduction in their own benefits, they are sometimes termed "non-contributory" benefits. Benefits to spouses equal half the worker benefits while survivors' benefits equal the full worker benefit. Spouses and survivors eligible for benefits both

[9] The Tax Policy Center (2009) compares personal income taxes with payroll taxes (including OASDI, HI, and the employer contribution for unemployment insurance) under a range of assumptions and definitions by income quintiles. Estimates for 2006 range between 54 and 83 percent of households paying more in payroll taxes than income taxes, depending on how the sample is defined (i.e., those who pay either income tax or payroll taxes, or those paying any payroll taxes) and whether the employer share of payroll taxes is included. Payroll tax reductions in effect in 2011 and 2012 temporarily changed the payroll tax rate and thus relative importance of payroll and personal income taxes for U.S. households.

[10] Earnings are indexed to two years before the earliest of the following: the year the worker a.) reaches age 62; b.) becomes disabled; or c.) dies. Earnings after age 62 are not indexed, providing a potential work incentive assuming wage growth.

[11] Research suggests that the current adjustments are roughly actuarially neutral (Heiland and Yin 2012, Munnell and Sass 2012).

[12] For example, in the case of a marriage that ends in divorce, the marriage needs to have lasted at least ten years. In cases of widowhood, the marriage needs to have lasted nine months, with some exceptions (for example, accidental deaths and deaths in the line of duty). A single worker can entitle multiple spouses to spouse and survivor benefits.

on their own record and on their spouse or former spouse's record receive the higher of the two amounts and SSA classifies them as "dually entitled." In December 2010, nearly 17 percent of total benefits to adults were awarded on the basis of marriage or presence of dependent children; for dually entitled workers, only the spousal or survivor benefit "top-up" over their own worker benefit counts toward this share (figure 2).

One anomaly this particular benefit design causes is that couples with equal earnings or taxes sometimes receive very different benefits. Figure 3 shows the maximum difference in benefits (as a share of the higher earner's benefit) for couples at each lifetime payroll tax level but different earnings splits between spouses.[13] It also juxtaposes the differences that exist before and after the higher-earning spouse's death. Equal treatment of those paying equal taxes and having equal combined earnings subject to tax would result in a horizontal line with zero difference at all earnings levels (the horizontal axis).

The figure reveals that differences in treatment for couples with different earnings splits between spouses are not linear. The biggest percentage discrepancies occur at very low earnings levels and then in the middle of the distribution. (Absolute discrepancies increase with earnings.) The intuition behind this pattern is that at some points in the lifetime earnings distribution progressivity can benefit both earners in a couple. The worst off couples for this comparison tend to be those in which one spouse is contributing to Social Security but getting no return because his or her auxiliary benefit will exceed her or his worker benefit. When both spouses are alive, couples receive the lowest benefits when the lower earning spouse earns between 20 and 50 percent of the earnings.[14] At all earnings levels, survivor benefits are lowest for couples with exactly evenly split earnings (i.e., when 50 percent of earnings were earned by each spouse).

Social Security law also includes a retirement earnings test (RET) under which SSA fully or partially withholds benefits for younger working beneficiaries – those below the full retirement age – with earnings above certain thresholds ($14,640 in 2012 for those below the full

[13] To construct this figure, we computed each spouse's PIA at each total earnings level (in $100 increments) assuming each spouse earned a given share (in five percent increments).

[14] At low earnings levels, earnings splits from 35 to 55 percent are worst for spousal benefits, while at high earnings levels, a split of 25 percent to the lower earning spouse is the worst. For much of the distribution, splits of 25 to 50 percent are equally disadvantageous.

retirement age).[15] If Social Security withholds any benefits under the RET, it subsequently repays them by adjusting the worker's benefit in a way that is roughly actuarially neutral. Since 1984, Social Security benefits have been subject to taxation through the personal income tax system. However, the U.S. tax code treats Social Security benefits preferentially, for example relative to similarly structured employer-sponsored pensions (DeWitt 2001). Only beneficiaries with modified adjusted gross income over $25,000 if unmarried or $32,000 if married pay personal income tax on their benefits.[16]

A closer look at several aspects of the program often reveals clear tradeoffs between adequacy, equity, and efficiency. The benefit formula's thirty-five year averaging period may have the progressive effect of reducing penalties for those with career interruptions for care giving or unemployment, disproportionately lower earners (Favreault and Steuerle 2008), but it also fails to reward those lower-wage workers who might work forty years or more (Steuerle and Bakija 1994; Goda, Shoven, and Slavov 2009).[17] At other times, these goals could be improved together. For example, some changes that increase adequacy would not reduce efficiency. At a time when family structures are changing rapidly, spouse and survivor benefits remain tied to legal marital status and a worker's lifetime earnings rather than a spouse's need or childrearing (for discussion, see, for example, Bennett 1979, Steuerle and Bakija 1994, Favreault and Steuerle 2007, and Harrington Meyer 1996). This design gives the greatest absolute benefit to those who marry the highest-earning workers. At the same time, single parents, an increasing share of all parents,[18] often do not qualify for these benefits even if they worked longer, paid more taxes, and raised more children than a married person.

The NCFRR Proposal

In February 2010, President Obama appointed the National Commission on Fiscal Responsibility and Reform to identify policies to improve the U.S.'s medium-term fiscal

[15] Rules for how the RET affects benefits are technically complicated. For example, auxiliary benefits generated by a worker may be withheld before the worker's own benefits. Also, at the full retirement age only, the income level at which benefits are phased down starts at $38,880 in the months before reaching it

[16] Income is defined as adjusted gross income plus non-taxable interest plus half of Social Security income. The share of Social Security benefits that are taxable increases when income exceeds $34,000 for unmarried individuals and $44,000 for married couples.

[17] Many people receive no returns at all for working and paying more payroll tax, but some others receive returns. These differences do not always relate to other objectives such as progressivity.

[18] In 2009, 41 percent of U.S. births were non-marital (Martin et al. 2011).

situation and achieve long-run fiscal sustainability. The commission released its recommendations, which included a detailed plan for Social Security, in December of 2010 (National Commission on Fiscal Responsibility and Reform 2010). The following are the plan's key OASDI provisions:

1.) A gradual increase in the Social Security earnings base so that it covers 90 percent of covered earnings;

2.) Gradual changes to the benefit formula to reduce benefit growth, particularly for higher-wage workers reaching retirement age in future decades;

3.) An immediate (2012) shift in the index used for adjusting benefits for inflation, which most analysts estimate will reduce benefit adjustments by between 0.25 and 0.3 percentage points each year;

4.) Increases in the early and full retirement ages for those born 1961 and later to roughly track life expectancy gains;

5.) An exemption from retirement age increases, known as the hardship exemption, for long-term, low-wage workers;

6.) For workers affected by the early retirement age increase, the option to collect up to half their benefits at age 62 (and the remainder later);

7.) OASDI coverage for newly hired state and local workers not currently participating in Social Security starting in 2020;

8.) A benefit increase of up to five percent of the average benefit for long-term beneficiaries (those who have been receiving benefits for twenty years or more); and

9.) An enhanced minimum benefit also targeted toward long-term, low-wage workers.

The NCFRR proposal is a useful example for this study of outcome measures. First, it is policy-relevant. A group that included elected representatives from both major political parties crafted the proposal, a majority of commissioners supported it despite its politically difficult recommendations,[19] and policy officials continue to use some of its provisions as a base on which to consider other program changes. Second, Social Security actuaries project that it would

[19] Eleven of the commission's 18 members voted in favor of the report—three short of the 14 votes required to issue the report to Congress.

put the system in long-run financial balance (Goss 2010). Third, it contains redistributive elements, other provisions geared at mitigating adequacy losses from benefit reductions, and many features that would affect equity between earners of different types.

Its various provisions interact in complex ways. Favreault and Karamcheva (2011) reveal that the NCFRR proposal would markedly change the distribution of benefits and taxes both within and across generations relative to current law, including scheduled, feasible, and payable benchmarks. The proposal achieves projected long-run balance through significant reductions in benefits relative to current law scheduled, especially for those with higher lifetime earnings in later birth cohorts.

Methods and Data

In this paper we present both new measures of outcomes and measures based on past Social Security literature. In both cases, we often use projections for the population as a whole based on DYNASIM, which provides simulations of lifetime earnings and benefits. This allows us to make both cross-sectional and longitudinal comparisons.

DYNASIM is a model of the growth and change in the U.S. population. It starts with a representative sample from the 1990 to 1993 panels of the Survey of Income and Program Participation and then ages this sample a year at a time through the 75-year projection horizon for Social Security cost analysis. Many key economic and demographic outcomes are calibrated to the intermediate assumptions of the 2011 Trustees Report.[20] (For additional information about DYNASIM, see Favreault and Smith, forthcoming, or the appendix table in Favreault and Karamcheva 2011.)

The proposal of the National Commission on Fiscal Responsibility and Reform (2010) provides an example by which to display the measures developed here. Favreault and Karamcheva (2011) provide details on the separate distributional effects of key plan

[20] Our earlier paper (Favreault and Karamcheva 2011) used economic and demographic assumptions from the 2010 Trustees Report. This paper's analyses are therefore not directly comparable to our prior paper. The OASDI Trustees review these assumptions annually, and groups of outside experts periodically review them as well. While some of the assumptions are somewhat controversial, the combined effects on long-range fiscal balance of changing some of the more controversial assumptions tends to be only modest because some assumption changes work in opposite directions and so offset each other (for example, Technical Panel on Assumptions and Methods 2011).

provisions.[21] Here our goal is mainly to use this proposal as an illustration of how to lay out a series of measures by which to compare alternative plans on grounds other than solvency.

When modeling the NCFRR proposal, we do not account for the effect of non-Social Security provisions such as changes in income tax rates or for most behavioral responses. Favreault and Karamcheva (2011) provide additional details of modeling choices.

Overview Issues on Outcome Measures

There is no consensus on a single way to show the distributional effects of Social Security alternatives like the NCFRR proposal relative to current law (Toder 2008). Some distributional analyses include the full OASDI program while others examine just Old-Age and Survivors (OASI) or Disability Insurance (DI); many exclude other benefit categories (for example, dependent children). Each of these choices has consequences for distributional analyses.

Several review articles identify important challenges for analyzing Social Security proposals (e.g., Leimer 1995; Geanakoplos, Mitchell, and Zeldes 1999; Toder 2008). When examining Social Security changes, researchers frequently use a range of outcomes. Annual benefits and benefits changes are typically the first but not necessarily the most important outcomes examined. Among other commonly used metrics are lifetime benefits and lifetime benefits compared to taxes (sometimes called "money's worth").[22] Lifetime comparisons include the ratio of benefits to contributions, the net transfer, the internal rate of return, and the payback period, and each has advantages and disadvantages (Steuerle and Bakija 1994; Leimer 1995). Similarly, replacement rate measures are frequently used in Social Security analyses (Grad 1990; Biggs and Springstead 2008; Mitchell and Phillips 2006).

[21] That paper showed a wide range of cross-sectional outcomes in 2030, 2050, and 2070, including benefits as a percent of scheduled benefits (both measures of central tendency and full distributions), real benefits, categorical benefit changes, and adequacy (using total income relative to 25 percent of the average wage as our metric). It also examined replacement rates and the ratio of lifetime benefits to lifetime contributions, including distributions of categorical changes and full distributions, all by lifetime earnings quintiles. Additionally, it made select comparisons by age, gender, and education.

[22] The term "money's worth" is somewhat controversial, given that Social Security is ultimately an insurance program—rather than a standard financial investment—that has mandated certain cross-generational transfers. The program's insurance protection has value whether one eventually needs it or not (i.e., just as fire insurance is valuable to those whose homes never burn, disability insurance is valuable to those fortunate enough to reach the full retirement age without experiencing a severe health condition that limits work ability). Also, programs that aim to redistribute cannot give everyone the same "money's worth." We thus prefer the term "lifetime measures" to "money's worth" when referring to these types of outcomes. Choi (1991) presents one argument against viewing Social Security primarily as a mandated savings program (and thus appropriate for "money's worth" analyses).

Speaking broadly of distributional analysis of changes to Social Security, Toder identifies as key issues defining the policy baseline, choosing a baseline population and unit of analysis, measuring income, and treatment of risk and uncertainty. Leimer (1995) identifies four important questions specifically surrounding the lifetime measures: financial balance (what Toder calls the policy baseline), tax incidence, interest rate, and transaction costs.[23] We address the fiscal balance issue next. In Appendix I, we address these other issues in turn, and also highlight the importance of the way analysts report benefits—in wage- or price-indexed terms—when comparing proposals.

The Choice of a Baseline (or Counterfactual) by Which to Make Comparisons

When examining the distributional effects of a proposal like that of the NCFRR, a first question one must address is to what the proposal should be compared. As Leimer (1995) and Toder (2008) both point out, comparing alternative proposals is challenging in the context of an imbalanced—which we can think of as an incompletely specified—system. According to recent projections, the U.S. Social Security system had an unfunded 75-year obligation on the order of $6.5 trillion, and in the 75th year of the projection horizon could only pay about 73 percent of scheduled benefits (Board of Trustees 2011).[24] Table 1 shows the Social Security Trustees' projected changes to payroll taxes and benefits required at two separate points—2011 and 2036, the projected year of Trust Fund insolvency—to achieve long-run (75-year) actuarial balance (OASDI Board of Trustees 2011). As the table shows, if Congress had acted immediately in 2011, permanent and universal benefit reductions of 13.8 percent, payroll tax increases of 17.3 percent (equivalent to 2.5 percentage points), or some combination of these two would be necessary. If instead Congress waits until the point of projected Trust Fund insolvency, the sizes of the required adjustments nearly double, to a 23 percent benefit reduction which would gradually increase to 26 percent in 2085 and a 32 percent payroll tax increase (equivalent to 4.0 percentage points initially and increasing to 4.5 percentage points in 2085). The significance of this underfunding makes it uninformative—and indeed unfair—to compare a proposal that

[23] Leimer also discusses the issue of whether data on workers/beneficiaries are hypothetical or actual. We focus on applicability to output from microsimulation models, which generally rely on for a full distribution of outcomes and include explicit survival adjustments.

[24] The OASDI Trustees Report also reports this obligation over an infinite horizon, which it projects to amount to $17.9 trillion in present value.

materially improves 75-year financing balance solely with current law scheduled benefits, since the latter does not specify who pays for those benefits.

Most U.S. Social Security researchers contend with this issue of financial balance by presenting a range of alternative balanced scenarios. They often bracket outcomes that would prevail under any proposal that improves the program's fiscal balance with outcomes prevailing under scheduled benefits (i.e., assuming no benefit reductions) and payable benefits (i.e., assuming all benefits are reduced proportionately at the point when the trust fund is exhausted). Some also include a proposal under which half of required revenues come from uniform tax increases and half from uniform benefit reductions (see, for example, the "feasible" benefits baseline in Bosworth and Burtless [2002] and Bosworth et al. [2003] that Favreault and Karamcheva use [2010]). Some analysts use also use a counterfactual that resolves the imbalance using only payroll tax increases (Clingman, Burkhalter, Wade, and Chaplin 2010a, 2010b, National Research Council and National Academy of Public Administration 2010).[25]

The widespread choice to use the scheduled and payable benchmarks as the two primary comparison points rests firmly in OASDI law. Scheduled benefits are well defined, yet the law is also clear that Social Security cannot pay benefits without a source of financing.[26] While this latter payable benefits benchmark thus has an important legal foundation, it is not entirely clear how researchers should define when and how the benefits are reduced given that the OASI and DI Trust Funds are separate entities.[27] Some assert it is not realistic to assume that Congress would wait until the trust funds were exhausted to address the underfunding problem.[28]

One alternative to assuming dramatic changes at Trust Fund exhaustion is to assume less dramatic changes sooner. Using actuarial estimates about the size of the unfunded obligation

[25] This latter counterfactual includes increasing both the rate (to a combined 14.7 percent employer and employee rate) and the tax cap (to cover 90 percent of earnings) and also adding a "second tier" for earnings above the taxable maximum (with no payment toward benefits) which would be subject to a lower tax rate.

[26] However, the law on what specifically would happen if the Social Security Trust Fund were to be exhausted is ambiguous (Scott 2009, Swendiman and Nicola 2010).

[27] While the Trustees Report projects the combined OASDI Trust Fund will be exhausted in 2036, it projects the DI Trust Fund will reach insolvency within the next decade (2018) while the OASI Trust Fund will remain solvent for another 20 years (until 2038). Historically, Congress has reallocated the payroll tax between the DI and OASI Trust Funds when one fund was close to exhaustion. However, it is possible, especially given recent brinkmanship on historically less controversial issues, that some members of Congress might block legislation that would reallocate funds and thus force Congress to take substantive action to pay for DI benefits by 2018. Analysts thus may wish to use payable (and analogously feasible) benchmarks under which reductions apply based on the respective trust fund from which benefits are paid, DI or OASI.

[28] Reno and Walker (2011), for example, characterize the payable benchmark as an improbable "policy failure" scenario.

today, "permanent and immediate" benchmarks would roughly adjust taxes and/or benefits, as shown in the first rows of Table 1. [29] This type of benchmark, too, rests on an unlikely assumption—that Congress would make significant changes to current beneficiaries' checks.

The "permanent and immediate" solutions could incorporate a phase in (for example, 10- or 20-years).[30] We do not use such comparisons here: we accept current law scheduled (benefits), feasible, and payable as the alternatives we use to assess proposals' impacts. We do not suggest that it is a perfectly balanced set of alternatives—indeed, we do not present counterfactuals that only increase payroll taxes—but it does represent at least a standard that provides some measure of balance. Our key point here is that policy analysts should recognize that these existing benchmarks have considerable limitations and that future work might expand these benchmarks. Analysts should consider whether any benchmarks imply certain policy conclusions in advance.[31,32]

Assessing NCFRR on Adequacy, Progressivity, Horizontal Equity, and Work Incentives

We now turn to the heart of this article--a variety of measures by which to assess a Social Security proposal such as the NCFRR plan. To provide context for these measures, Appendix II provides a brief review of measures that government and other researchers have developed and used. We expand on these efforts here. Box 1, below, summarizes the measures we employ.

[29] This is consistent with OACT's symmetric approach to computing lifetime measures, which we discuss in Appendix II.

[30] Phase-ins reduce large, marked discontinuities in Social Security benefits. This is potentially desirable because significant OASDI changes have rarely been sudden or draconian; they have historically occurred over extended periods. For example, the 1983 amendments incorporated a full retirement age increase that first began affecting beneficiaries in 2000 but will not be fully phased in until 2022, a phase-in period that started 17 years after enactment and will complete 39 years after enactment. Further, uncertainty is also important, as Sabelhaus and Topoleski (2007) point out. Solving the full 75-year underfunding problem immediately could lead to over-correction, with deleterious economic implications for current beneficiaries, and perhaps the economy more broadly. On the flip side, underreacting could lead to even steeper required costs for future generations.

[31] A concern is that when one selects an alternative benchmark one is either setting up a straw man or implicitly arguing that the particular counterfactual should be the default for action on Social Security underfunding (i.e., a payable alternative implies that Congress *should* reduce benefits rather than raise payroll taxes when the Trust Fund is exhausted). "Feasible" alternatives may be preferable to benefit-only or payroll tax-only counterfactuals in this regard, but even they lead some to question the reasonableness or optimality of the implicit assumption of a 50-50 split between tax increases and benefit reductions (rather than, say, 60-40 or 30-70, or the two-thirds and one-third splits in the National Research Council and National Academy of Public Administration [2010] report). Analysts can minimize such controversies by using multiple counterfactuals so as not to privilege one strategy for dealing with the unfunded obligation over another.

[32] Schultz and Nickerson (2011) discuss alternative ways of expressing the unfunded obligation, distinguishing between accruals to those already alive and obligations to future birth cohorts.

Box 1
Measurements of the Impact of the NCFRR on
Adequacy, Progressivity, Horizontal Equity and Work Incentives

A. Adequacy and Anti-Poverty Effectiveness
   a. Annual Poverty Levels, Gaps, and Intensity for Social Security Beneficiaries (Exhibit 1)
   b. Poverty Among Social Security Beneficiaries by Time in Poverty (Exhibit 2)

B. Progressivity
   a. OASDI Benefit Progressivity Over Time, by Gini Coefficient (Exhibit 3)
   b. OASDI Progressivity: Payroll Tax Percentiles Relative to Benefit Percentiles (Exhibit 4)

C. Horizontal Equity
   a. Variation in OASI Benefits for Individuals With Equal Lifetime Payroll Taxes (Exhibit 5)
   b. The Distribution of Lifetime Spousal and Survivor Benefits (Exhibit 6)

D. Work Incentives
   a. Effective Marginal Tax Rates, Net of Benefits, for Workers at Age 60 (Exhibit 7)
   b. Ratio of Shared Lifetime Benefits to Shared Lifetime Payroll Tax Contributions under NCFRR and Current Law by Shared Work Years (Exhibit 8)

Measures of Adequacy and Anti-Poverty Effectiveness. In the United States, an absolute standard, usually the federal poverty level (FPL), is the starting place for most analyses of Social Security benefit or income adequacy.[33] Concerns with the FPL are numerous and well

[33] Some (Fisher 1992; Fremstad 2008) prefer to avoid the term "absolute" for describing the current federal poverty level, given its reliance on consumption patterns. However, most literature uses the term and makes this distinction (for example, Burkhauser 2009).

documented (for example, Citro and Michael 1995, Ruggles 1990). These include whether income or consumption should be the focus, how to develop equivalence scales for households of different sizes and types, how to adjust for regional variation in cost of living (and the quality of housing and community amenities), how to treat in-kind transfers, whether to consider gross or net income, how to factor in wealth (including home ownership),[34] whether capacity/preference for work should be considered (Haveman 1992-1993), and how to account for necessary expenses (like job-related transportation or out-of-pocket medical expenses).

Nonetheless, the FPL (including multiples of FPL) is still the most widely-used measure of adequacy in Social Security analyses. It is accessible to lay audiences and has a straightforward interpretation. It also can be computed reasonably consistently over time. Some research also shows that the official poverty measure is well correlated with objective measures of needs (e.g., food insecurity) (Fremstad 2008). Selected Studies Table 1 describes a small set of analyses of Social Security adequacy, and shows how prevalent the poverty measure is in adequacy studies. Researchers frequently supplement the traditional poverty measure with measures of poverty or near poverty, which they typically define based on some multiple of poverty (for example, income of greater than poverty but less than 125 or 150 percent of poverty). As the table also shows, another strategy this literature uses to address targeting is to display the share of benefit changes going to different groups before and after a policy change. There are of course challenges with using official poverty measures, including determining which poverty measure one should use.[35]

While most adequacy analyses that use the FPL focus on total income, some research has examined how Social Security benefits on their own relate to the poverty threshold (for example, Favreault 2010, Favreault and Sammartino 2002, U.S. GAO 2001). The rationale for this approach is to describe beneficiaries' economic vulnerability if only OASDI were available to them and to show the level of effort necessary to insure against poverty with OASDI benefits alone.

[34] Issues surrounding wealth are important for the aged population that is so central to Social Security analysis. While in practice income from wealth may be realized only sporadically, it nonetheless exists as a source upon which beneficiaries can draw (recognizing that wealth has both liquid and non-liquid forms and the latter may be less practical to convert over shorter time horizons).

[35] The Census Bureau produces estimates of the federal poverty level, which somewhat controversially varies by age of the household head, while the U.S. Department of Health and Human Services produces poverty guidelines. In Social Security analyses, the population may include both aged and non-aged households (for example, DI beneficiaries, early survivors, and age 62 retired worker claimants), complicating choices when using the FPL.

Additionally, measures of poverty gap and poverty intensity in the U.S. often use the FPL as a starting point. The poverty gap is the difference between the poverty level and income among those in poverty and can be interpreted as the minimum amount needed to eliminate poverty. Poverty intensity measures give greater weight to deeper poverty. For example, Rupp, Strand, and Davies' (2003) work on the Supplemental Security Income program (SSI), which relies on indices developed by Foster, Greer, and Thorbecke (1984), presents poverty alleviation information for a series of alternative changes to SSI. This approach could be extended to OASDI analyses.

Recently, the Census Bureau released income adequacy estimates for the U.S. population using a supplemental poverty measure (Short 2011). This measure attempts to address concerns with the FPL by updating thresholds (moving away from the benchmark Orshansky pioneered, a multiplier applied to a thrifty/low-cost food budget), accounting for regional variation, using more inclusive resource definitions so that in-kind benefits like housing and nutritional assistance count toward well-being, and accounting for out-of-pocket medical expenses. Under this measure, the share of older Americans who Census classifies as economically vulnerable increases markedly, while the share of children in poverty declines (Short 2011, Butrica, Murphy, and Zedlewski 2008). At a state level, some measures of economic insecurity/material deprivation—particularly measures associated with housing, including housing cost burdens and housing crowding— may better correlate with the supplemental poverty measure than the official poverty measure, while others, including food insecurity measures, may better relate to official poverty (Renwick 2011).

As it is relatively new, few researchers have used the supplemental poverty measure to analyze Social Security adequacy. However, this is likely to change. For example, plans to expand the Social Security Administration's Modeling Income in the Near Term (MINT) data system to include out-of-pocket health care expenses demonstrate analyst interest in developing capacity to use multiple poverty measures in future MINT policy analyses.

In the European Union, in contrast, adequacy analyses often focus on a relative measure: half of median equivalent income. A substantial literature, largely centered in Europe, also considers social exclusion to try to better capture experiences of deprivation along both material and social dimensions (see, for example, Gilbert 2009). U.S. research on social insurance rarely

incorporates these additional details, though this may change as deprivation indicators become more extensively used and validated in the U.S.

Few measures of Social Security adequacy take a longitudinal perspective. No doubt, data limitations have contributed to the relative scarcity of such descriptions. While high-quality lifetime earnings data have become increasingly available in recent decades, data with the full array of elements required to compute poverty over long periods remain scarce. Many dynamic microsimulation models now produce long series of demographic and economic outcomes, including earnings, Social Security and pension benefits, and income from wealth, so it is timely to reassess what lifetime adequacy measures would work best in the context of evaluating alternative proposals for policy audiences.

Rodgers and Rodgers (1993) authored important early work on lifetime poverty measures.[36] Their conceptual framework relies on the notion that individuals can theoretically borrow from themselves across the lifespan. A key insight from their work is that it is important to distinguish between short periods of below-poverty income for those with relatively high lifetime incomes and chronic poverty. They also point out many of the complications that arise when examining adequacy over a lifetime. In more recent work, Hoy, Thompson, and Zheng (2011) and Hoy and Zheng (2011) similarly emphasize the primacy of chronic poverty (as opposed to short spells) and discuss the issue of whether poverty spells at different points in the life course should be weighted differently, given the possibility that early poverty spells could, for example, be particularly damaging to lifetime income prospects. In one recent comparative analysis, Muffels et al. (2000) construct a few intuitive longitudinal measures over two intervals including the medium term, which they define as five years, and long term, which they define as ten years.[37] They use poverty profiles in which they classify the population into four categories: the never poor, the transient poor (those with a single poverty episode of one year), the recurrent poor (more than one poverty spell, but no spell longer than two years), and the persistent poor

[36] Analyses of poverty spells (including, for example, duration of spells, time between spells, and poverty exit and entry rates) are an important part of the literature on longitudinal poverty analysis. Studies in this area have included Bane and Ellwood (1986), Rank and Hirschl (1999, 2001), Ratcliffe and McKernan (2010), and Stevens (1994). Such analyses may be less useful for Social Security than for government programs that target and serve primarily younger individuals because earnings, the primary income source for most individuals earlier in adulthood, are so much more volatile than Social Security benefits, which are guaranteed for life (for retired workers) and inflation-indexed.

[37] She and Livermore (2009) look at poverty for 36 months over a 48 month period in a SIPP-based analysis focused on disability.

(those who were poor for at least three consecutive years). This promising approach is both easy to understand and has less burdensome data requirements than a full lifetime poverty measure.

Here, we draw from Foster, Greer, and Thorbecke (1984) and Muffels at al. (2000) to examine current law and the NCFRR proposal using several adequacy metrics: changes in poverty, poverty gap, and poverty intensity and then our lifetime measure, years in poverty, for which we do not discount. [38] The longitudinal aspect of our adequacy measures is innovative. While some Social Security analyses examine poverty reduction at a point in time, consideration of longer-term poverty in a Social Security context is rare.[39]

We juxtapose the measures of the poverty gap, poverty intensity, and lifetime poverty in 2030, 2050, and 2070 for the NCFRR and standard current law counterfactuals (scheduled, payable, and feasible) (Exhibit 1). For the NCFRR simulation, we show results both assuming full half benefit claiming and no half benefit claiming (see the discussion in Appendix III, sections AIII.3 and AIII.4). We present both wage-indexed and price-indexed versions of each measure to highlight differences between absolute and relative well-being. A striking pattern is that while DYNASIM projects that price-indexed poverty will decline over time assuming scheduled benefits, it projects wage-indexed poverty will rise. In 2050 and 2070, DYNASIM projects that the NCFRR proposal would lead to poverty increases relative to current law scheduled (which does not specify where revenues to balance the system would come from), but the increases are lower than the alternative counterfactuals that achieve 75-year balance (feasible and payable). This applies to levels, gaps, and intensity, whether wage- or price-indexed. A number of NCFRR proposal provisions contribute to these patterns, including the expanded minimum benefit, the hardship exemption, and the targeting of benefit reductions through the formula to those workers with lifetime earnings other the median.

Exhibit 2 examines projected price-indexed poverty, separately by five-year birth cohorts, taking into account how long poverty endured through retirement (here defined from age 62 to

[38] Previous Urban Institute analyses of benefit adequacy under the NCFRR proposal computed the share of beneficiaries with incomes below 25 percent of Social Security's average wage index (AWI) under the proposal and the scheduled, feasible, and payable benchmarks (Favreault and Karmacheva 2011, Table A.7, Figure 17). We chose 25 percent of the average wage because in 2011, a quarter of AWI ($11,172) roughly equals the FPL. For those age 65 and older living alone, the 2011 FPL is $10,458. We use a higher threshold when defining low-income married couples, to reflect the greater consumption needs for two-person households than for those living alone. Because the FPL assumes that a two-person aged household needs 126 percent more income than a one-person household, our low-income threshold for couples equals 126 percent of one-fourth of AWI (or $14,095 in 2011).

[39] Favreault (1998) contains one example.

death).[40] While about three-quarters of the population avoids aged poverty, the majority of those who do experience it tend to have spells of at least three years (characterized here as chronic poverty). Poverty increases are lower under the NCFRR proposal than under the feasible and payable options that restore balance and are modestly higher than scheduled benefits. The NCFRR plan does not, at the same time, reduce poverty (which could be a goal for changes to the program), and it protects the chronically poor less than the transient and recurrent poor. Work years testing for the minimum benefit and hardship exemption surely contribute to this.

Progressivity. Because benefit progressivity is a strategy for promoting adequacy, this literature can help inform us whether proposals to change Social Security efficiently target resources toward that particular goal. A large literature, dating back to Friedman (1962) and Aaron (1977), has explored issues of the degree to which socioeconomic and racial differentials in earnings, mortality, marriage, and other factors may erode the progressivity in the OASDI benefit formula. Leimer (1999) provides one review of this literature, and Kiefer (1984) reviews progressivity measures' characteristics. Selected Studies Table 2 summarizes several studies from this area. As the table shows, the Gini coefficient is one widely used measure of dispersion of benefits and income both in analyses for the U.S. and internationally. This literature also relies heavily on lifetime measures like the internal rate of return and lifetime transfer, which authors compare across lifetime earnings groups. Gustman and Steinmeier (2001) and Gustman et al. (2011) use a redistribution measure, which they define as the percent deviation from benefits if the tax-benefit ratio for a given cohort were the same as it is for the cohort as a whole, and Coe and colleagues (2011) use an analogous measure.

Biggs, Sarney, and Tamborini (2009) develop a progressivity index that relies on Lorenz curves and the Gini coefficient, thus echoing Suits (1977). SSA researchers use this metric in a number of publications that use MINT to show the effects of various policy changes (for example, Sarney 2008, 2010, Whitman 2009).

We use the Gini coefficient and some graphics drawn from the progressivity index approach to illustrate how lifetime benefits and contributions under NCFRR compare to counterfactuals based on current law. Exhibit 3 shows how the Gini coefficient evolves over time

[40] If one were to add rows to this table (for example, to take into account education or lifetime earnings), differential survival would become an important factor. That is, those living longer are at risk of poverty in more years—so even if risk was lower at each point in time, cumulative effects could be greater.

under the NCFRR proposal. Under current law, Social Security benefits are already more evenly distributed than other incomes sources, like earnings and total income. Under the NCFRR option, the Gini coefficient for cross-sectional benefits declines moderately. Benefits become increasingly more evenly distributed over time, with greater equality when we assume that no one claims the half benefit. While we compare NCFRR to current law scheduled benefits, the Gini coefficient would be the same under other alternatives to current law that proportionately reduce benefits across the board, such as current law payable and feasible. [41]

Similar relationships hold for the relationship of benefits to contributions, which we show by drawing from the discussion of the progressivity index Biggs et al. (2009) describe. Exhibit 4 compares cumulative payroll taxes to cumulative benefits between current law scheduled and the NCFRR proposal for individuals born from 1961-1965 (relatively early in the proposal's phase in). Consistent with Exhibit 3 and earlier findings from Favreault and Karamcheva (2011), we see increased redistribution. More of the cumulative benefits go to those lower in the cumulative tax distribution than under current law scheduled, due largely to steeper benefit reductions for higher earners.

Horizontal Equity. Horizontal equity refers to the equal treatment of individuals or households in similar circumstances.[42] The tax literature has frequently addressed horizontal equity (Musgrave 1990, Auerbach and Hassett 1999, Steuerle 2002). Although the proposition usually draws little objection and can be traced back generations, some skeptics question the appropriateness of prioritizing horizontal equity (Kaplow 1989; 2000) over efficiency.[43]

In the context of the U.S. Social Security system, one conspicuous horizontal equity issue is how the program treats different couples with similar total lifetime payroll tax contributions (or equal lifetime earnings subject to tax) and unmarried parents who raise children (Steuerle and Bakija 1994, Favreault, Sammartino, and Steuerle 2002). The system design centers around the model of a household with a single-earner couple and children. This led over time to preferential treatment for many single-earner couples relative to dual-earner couples or single parents, both

[41] We thus do not display current law payable and current law feasible, as they are identical to current law scheduled in this cross-sectional context.
[42] Some use the term "equal justice."
[43] The two often go hand-in-hand. If two people in equal circumstances are treated differently, it is unlikely that resources are targeted well to their needs or allocated to maximize incentives. As the two are in equal circumstances, a policy that is fair or efficient for one should be fair or efficient for the other. See also Okun (1975).

when the two spouses are alive and after a higher-earning spouse dies. As a result, survivors in couples with fairly even earnings splits between the two partners often experience steep declines in household Social Security income when widowed.

The Social Security system's requirements surrounding marriage can also lead to other anomalies like marriage bonuses, remarriage penalties, and eligibility cliffs at the ten-year marriage duration. The system bases access to many adequacy benefits on legal marital status rather than provision of care (such as childbearing and child rearing), even though one rationale for marital bonuses is to provide a family replacement rate that implicitly compensates for raising children. These bonuses fail to reach a large share of single heads of household, disproportionately women, today.

Some researchers argue that tying benefits to legal marital status rather than care partially explains why the U.S. compares less favorably to other similarly wealthy countries on indicators like aged poverty and near poverty (Herd 2009; Harrington Meyer 1996; Favreault and Steuerle 2007). Those with higher lifetime earnings and education are more likely to be married, underscoring how these provisions do not redistribute in ways that would maximize adequacy. Similarly, unlike many other countries, the U.S. grants these non-contributory benefits in proportion to the worker's benefit rather than providing them evenly to spouses and survivors.

These family structure issues are not the only reasons households with the same lifetime payroll tax contributions end up with different outcomes. In any cross-section of beneficiaries at a point in time, other reasons include the following: timing of earnings; number of years of earnings, including the year of entry into the covered labor market; and the relative ages of spouses for married people (which affects expected duration of survivor benefit receipt, for example).[44] These generally add to horizontal inequity. Other differences do not necessarily add to horizontal inequity, as they are intended to provide actuarially fair adjustments on an ex-ante or insurance basis. These include disability status, the choice of claiming age, and whether one

[44] Gustman and Steinmeier (2000), for example, point out how the progressivity of the OASDI benefit does not distinguish between immigrants who earned high wages over a truncated career and workers who earned low wages over many years. High replacement rates for high wage workers who entered the U.S. late in life. Analogous issues can arise due to uncovered employment, except Government Pension Offset and Windfall Elimination Provision address this for certain uncovered workers.

is affected by the RET. On a lifetime basis, the RET and claiming age should not matter, on average, but differential longevity can play an important role.[45]

Assessment of reform proposals by government rarely provides measures of horizontal equity, although researchers could tap a modest literature here. Selected Studies Table 3 presents a summary of several studies with this focus. Favreault and Steuerle (2007) establish a set of criteria for judging alternative changes to Social Security including whether they help single parents and tend to equalize the lifetime benefits of couples paying similar lifetime payroll taxes. Herd (2005) directly addresses horizontal inequities arising from Social Security non-contributory benefits, considering those benefits distribution by lifetime assets, as well as marital and childbearing status.

In previous Social Security studies with a focus on horizontal equity issues, researchers often use such standard outcomes variables as net lifetime transfer, and then descriptive classifier variables (CBO 1986, Favreault and Steuerle 2007).[46] Looking at a similar issue, cross-sectional marriage penalties and bonuses in the personal income tax code, researchers from CBO present a matrix of spouses' respective earnings and classify the couples into shares with a bonus or penalty (CBO 1997).

Our analyses of horizontal equity under current law and the NCFRR proposal build on these other efforts, similarly taking advantage of the population estimates made possible by micro-simulation.[47] First, in Exhibit 5 we display scatterplots that depict the variation in lifetime benefits for those with equal lifetime payroll tax contributions, which is roughly equivalent to equal lifetime earnings subject to payroll tax.[48]

We simply compare how individuals' *annual* benefits at a point in time (specifically 2070, when the NCFRR proposal is fully phased in) relate to their lifetime payroll taxes, after reducing any differences due to actuarial reductions and delayed retirement credits. That is, we seek to isolate in an annual measure (which also eliminates differences due to longevity) those

[45] Lower earning individuals have shorter average life expectancies but receive the same actuarial adjustment in their benefits for early or delayed retirement.

[46] The series of row variables that studies use include the following: 1.) marital status; 2.) the intersection of marital status and years worked in the paid labor force ; and 3.) the intersection of present value of lifetime earnings and split in earnings between spouses.

[47] Previous Urban Institute NCFRR analysis (Favreault and Karmacheva 2011) did not report any measures of horizontal equity and effectiveness in targeting of non-contributory benefits.

[48] Biggs (2009), among others, uses a similar strategy of displaying scatterplots to show variation in outcomes among units with similar lifetime earnings.

sources of variation that reflect horizontal equity issues, but not actuarially fair differences due to, say, time of claiming. We focus here on ages 70 to 74.

In terms of averages, we see a pattern that resembles the PIA formula depicted in Figure 1.[49] Those differences reflect progressivity. However, at any given level of lifetime taxes, we see some significant deviations from the formula under both current law and NCFRR. A small share of individuals pay no or almost no payroll taxes yet receive significant benefits, presumably spouses and mostly survivors. One way we can summarize these deviations into a single statistic is to examine the coefficient of determination ("R-squared") from a simple linear regression relating benefits at a point in time (say, age 67) and lifetime payroll taxes. When we do this on an individual basis, we obtain a value of 0.62 under current law and 0.53 under the NCFRR.[50] (On a shared basis, the gap between current law and NCFRR narrows more.)

These analyses suggest that the NCFRR proposal does little to tackle these horizontal inequity issues. The variations for the most part remain, which is to be expected since the proposal did little to remove those inequities that arise from spousal and survivor benefits and, for the most part, years of work that the benefit computation does and does not count.

Next, following upon Herd's approach of considering the distribution of non-contributory benefits and expanding it to a lifetime context, we compare lifetime non-contributory spousal and survivor benefit amounts by shared lifetime payroll tax contributions and lifetime payroll tax splits between spouses (Exhibit 6).[51] The pattern for shared lifetime payroll tax quintiles is quite pronounced. In the two birth cohorts examined (5-year birth cohort groups, 1961-65 and 1976-80 cohorts), the share of non-contributory benefits changes modestly under NCFRR.[52] NCFRR modestly decreases the projected share going to the highest two quintiles and increases the projected share going to the lowest two quintiles. This result largely reflects the proposal's overall reduction in the growth in benefits for future higher lifetime earners.

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[49] Turning to a more complex relationship—the relationship between lifetime shared payroll tax contributions and lifetime shared benefits, similar scatterplots would reveal more deviation from the PIA formula outline. However, with lifetime measures, differences arise in no small part because of longevity. This complicates these particular measures' usefulness for measuring horizontal equity given that mortality differences include both systematic components and random components.

[50] This measure is simple and imperfect

[51] One challenge is determining whether to attribute benefit supplements under the NCFRR plan, like the long-term beneficiary bump-up, to the non-contributory or contributory share of the program. We assumed that these supplements were all worker benefits. For the minimum benefit, we also assumed that the entire supplement was contributory, given the basis in the current law special minimum PIA.

[52] Projections for the intervening cohorts fall between the early and later cohorts.

The proposal also increases the share of non-contributory benefits going to those married people with only one earner or a very skewed sharing of lifetime taxes and earnings. Interestingly, however, the group that experiences the greatest relative decline in the share of non-contributory benefits they receive is the group with the next least evenly split earnings between spouses: those where the lower-earning spouse paid between 10 and 20 percent of the shared payroll tax. This pattern harkens back to Figure 3, where the effect of spouses' splits earnings is not monotonic across the lifetime earnings distribution.

Overall, the projected share of total adult benefits that are non-contributory declines across cohorts under NCFRR. While in the first cohort, the projected share that is non-contributory declines by 5.6 percent, by the 1976 to 1980 cohort, it declines by 15.5 percent. Effectively, a greater share of the system is devoted to worker benefits, so NCFRR would reinforce an on-going pattern where such noncontributory benefits decline over time as more women spend greater shares of their lifetimes in the workforce.

Putting all these points together, the NCFRR proposal targets higher shares of non-contributory benefits to those with lower lifetime earnings, but does not remove the horizontal inequities those couples with more evenly split earnings bear.

Measures of Economic Efficiency/Work Incentives

A predominant theme in analyses of marginal and implicit tax rates under Social Security is that work incentives are quite variable for workers with different work and marital histories (Feldstein and Samwick 1992; Goda, Shoven, and Slavov 2009). Selected Studies Table 4 summarizes a few studies in this area.[53]

This heterogeneity in incentives to work stems from many of the same sources that affect horizontal equity: the 35-year computation period for AIME (and thus PIA), the 10-year vesting period, spousal and survivor benefits, and others. They also result from the progressive benefit formula (and progressive income tax formula for those subject to personal income taxation of Social Security benefits), issues some may not associate with horizontal equity/inequity. A prominent factor here is that many workers receive limited or no return on their incremental

[53] Burkhauser and Turner (1985) produced some of the earliest work on this topic. Sabelhaus (2007) computes effective tax rates from an additional year of work. Reznik, Weaver, and Biggs (2009) use a lifetime orientation, by computing the marginal internal rate of return for an extra year of work before retiring and the incremental rate of return. Analyses are less likely to show the effects of improved incentives on the system's financing.

Social Security payroll tax contributions because (1) Social Security gives them little or no credit for years beyond 35 of work, even though someone who works from, say, 21 to 65 will work for 45 years; (2) many spouses and survivors get little or no extra return beyond what they would receive if they did not work; and (3) some have insufficient covered earnings to qualify for benefits.[54] For other workers additional earnings will not change work incentives.

For high income workers disincentives may go both ways. The higher earnings may put them at a point in the benefit schedule that produces a very low return for marginal work. On the other hand, those earning above the taxable maximum will pay no marginal tax for any earnings above the taxable maximum.

Others may have strong incentives to work (negative tax rates). This can occur, for example, when additional earnings allow one to qualify for benefits (because one reached the 40 covered quarters threshold), when one's earnings fall in the 90 percent replacement bracket, or when one has a low-earning spouse who could qualify for significant benefits.

For these analyses, we again take advantage of the population estimation made possible by a large micro-simulation model. We compute two measures of work incentives by which to compare current law and NCFRR: the marginal net tax rate net of benefits at age 60 (as in Feldstein and Samwick 1992) and lifetime transfers by earnings by work years categories. We chose age 60 for the marginal rate analyses because it is a time when incentives become more powerful as the choice to retire is less of an option for most before then.

Exhibit 7 depicts percentiles of workers' marginal tax rates under current law (scheduled, feasible, and payable) and the NCFRR proposal at age 60 for men and women, respectively, born from 1976 to 1980. (We chose this cohort because they feel significant effects from NCFRR and would experience the impact of higher tax rates, e.g., under a feasible approach.) Looking first at current law scheduled, we see that there are three separate segments of the distribution: a rising segment, a flat segment, and then a segment where workers feel the full payroll tax and receive no additional benefits.

[54] For example, for members of the 1935 through 1944 birth cohorts who survived through age 60, almost two-thirds of men had over 35 years in which they earned at least four covered quarters, and well over two-fifths had at least 40 such years (Favreault and Steuerle 2008). Only about 21 percent of the women in these cohorts reached 35 years, but the share of women with lengthy careers has been increasing rapidly (Ibid). Goda, Shoven, and Slavov (2009) point out that the modal age for reaching 35 work years is 55.

One conspicuous conclusion is that around two in five of workers fall into the pure tax (no additional benefit) category under almost any approach.[55] In these cohorts, patterns for men and women are broadly similar, though with fewer women experiencing the zero percent rate because of earnings at the taxable maximum (i.e., they neither pay taxes nor accrue benefits at the margin). Patterns for other cohorts who will be even more affected by NCFRR are similar.

Under the NCFRR proposal, most workers low in the tax distribution experience higher tax rates (i.e., worse incentives) than under current law scheduled or payable, which corrects the funding shortfall on the benefit side. However, incentives are better than under current law feasible which has higher tax rates for all workers (as opposed to NCFRR's tax base expansions that only affect higher earners). The intuition behind this is that many workers are already in a category where benefit gains from work are limited because of the 35-year computation period or some other factor, so they mainly face additional taxes.

Exhibit 8 provides another take on work incentives: an examination of how family work years and shared lifetime earnings related to shared lifetime treatment by Social Security (the interaction between earnings and work years is necessary because work years alone are so highly correlated with AIME). Within the four lifetime earnings groups shown, the table reveals limited differences between work years groups, both under current law, the NCFRR proposal, and the other counterfactuals (scheduled and payable). In the lowest lifetime payroll tax category, there is some suggestion that the NCFRR minimum benefit and hardship exemption improve the relative standing of long career workers (see the ratios of greater than one for those with 35 to 39 or 40 or more work years). But in other lifetime payroll tax categories, the relative differences across work years groups are modest.

Technical Issues that Arise when Presenting Outcomes from Microsimulation Analyses of Social Security Changes

Thus far we have focused on bigger picture issues of Social Security benefit distributions, fairness, and incentives, but would be remiss if we did not point out a large number of technical challenges that can have surprisingly large effects on projections of distributional effects of a proposal to alter Social Security. Appendix III discusses complications like distinctions between

[55] The estimate of the share varies according to the assumed discount rate.

group-level and individual experiences, effects of outliers, transitory benefit changes, and changing beneficiary populations.

Conclusions

The availability of high-quality projections from microsimulation models, several of them developed by SSA, now provides an opportunity to assess OASDI reform on broader grounds than simple actuarial balance. As with most policy analysis, no single outcome measure is sufficient by itself, so it is useful to present several. Also, because Social Security affects multiple generations, it is crucial to examine results over time, not just at one single time point.

While analyses of winners and losers are increasingly common, they tend not to tell us much about whether Social Security is meeting various equity and efficiency objectives. We suggest that Social Security measures should include effects on poverty or adequacy, progressivity, horizontal equity, and work incentives. We recognize that we have just scratched the surface of possible measures, and analysts could examine many permutations.

Our analyses also lead to some substantive conclusions about both current law and the NCFRR proposal. Under current law, we can sometimes advance well-defined objectives, such as horizontal equity or work incentives without doing worse on other objectives. With respect to the NCFRR proposal, several adequacy results are important. For lifetime poverty and cross-sectional poverty, poverty gap, and poverty intensity, the NCFRR proposal leads to poverty increases relative to current law scheduled, but they are smaller increases than under current law feasible (and certainly current law payable). It also directs a greater share of auxiliary benefits to lower earners than current law scheduled. On fairness between couples with similar earnings but different splits between spouses, patterns are less conclusive, and may lessen fairness in some circumstances. On work incentives, the NCFRR approach compares less favorably for many workers than current law scheduled and payable, but generally does better than proposals like feasible that include universal increases in tax rates (as opposed to NCFRR's tax base expansions that only affect higher earners).

By making use of these types of outcome measures, we believe policy makers can design future proposals in ways that advance important equity and efficiency objectives. They will also have available a consistent way by which to compare proposals and their adherence to basic principles of public finance.

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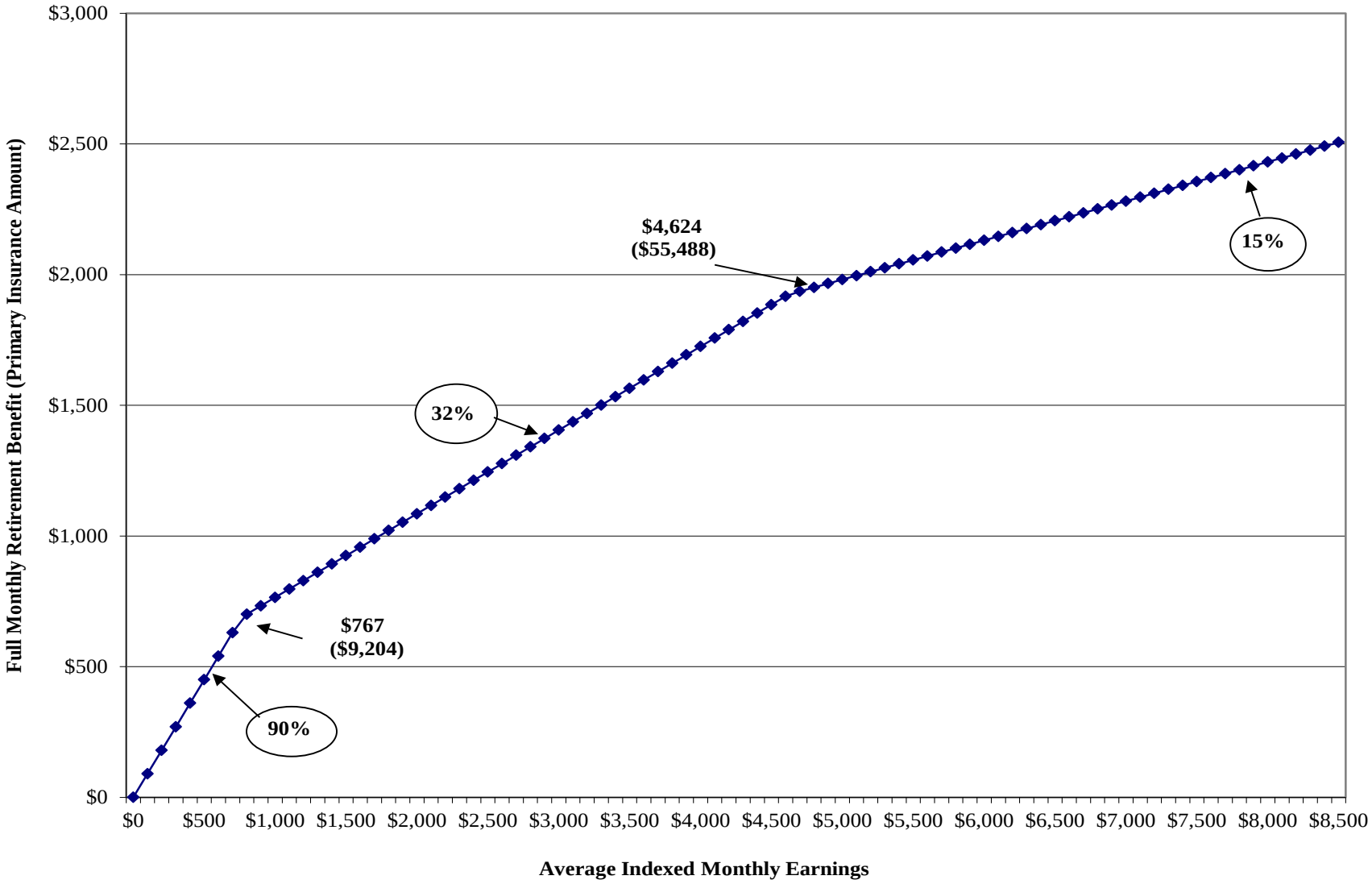
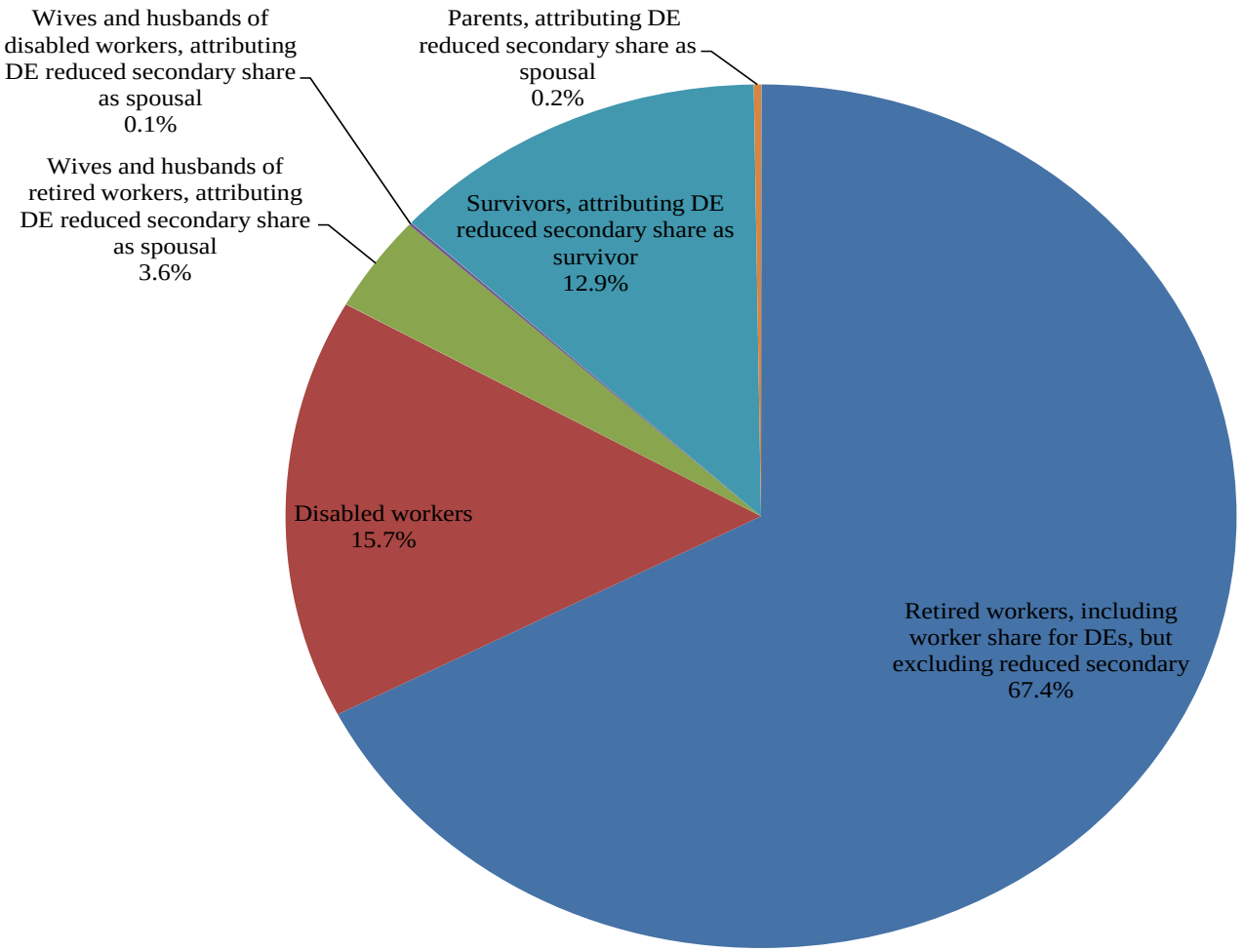
Figure 1. Social Security Benefit Formula, 2012



Notes: Replacement percentages appear in circles; annualized values for bend points are in parentheses.

Figure 2. Aggregate Adult OASDI Benefits by Type, December 2010



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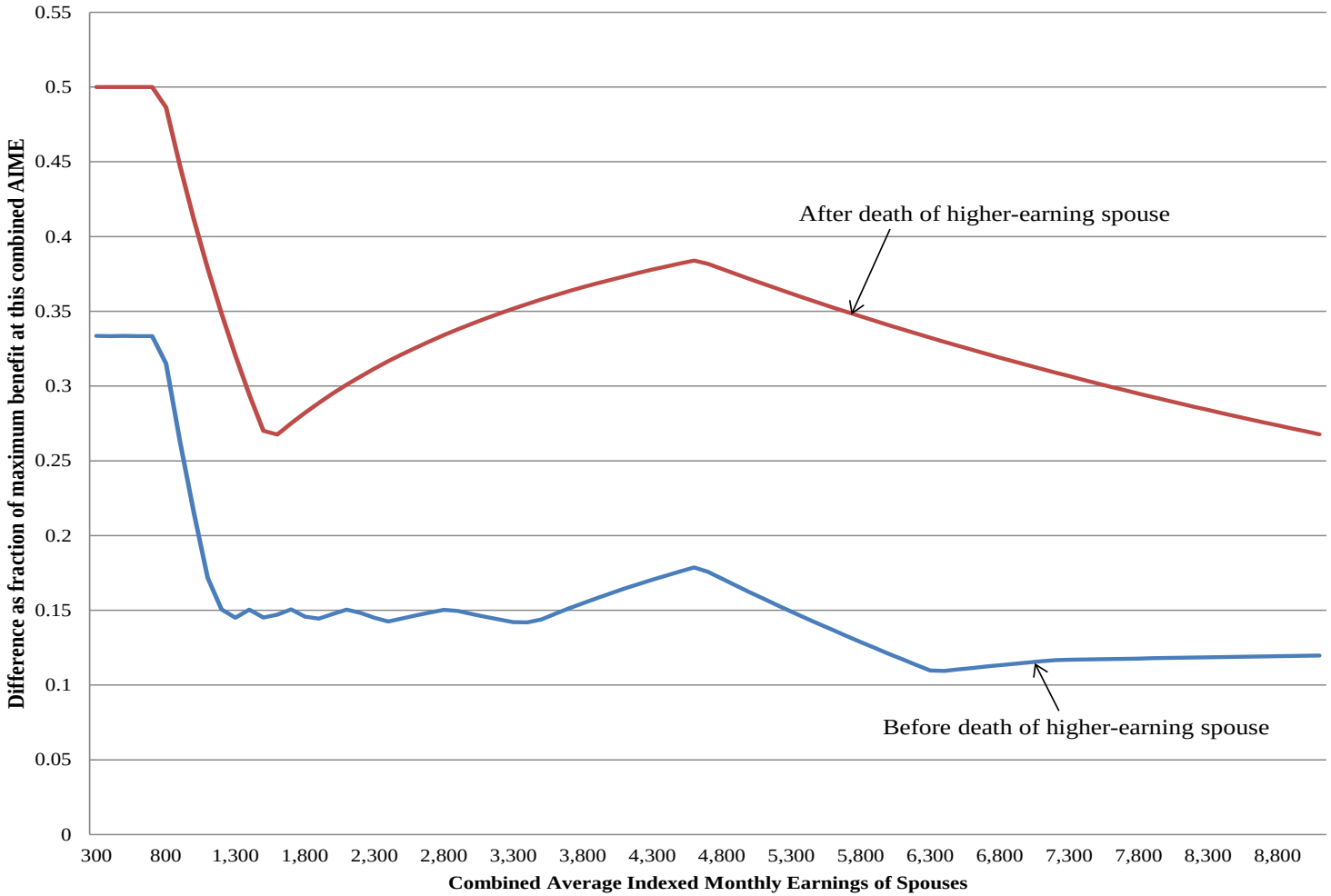
Notes: Excludes Disabled Adult Children (DACs). DE=Dually-Entitled worker.
Source: Urban Institute calculations from Tables 5.A16 and 5.G3, *Annual Statistical Supplement* to the *Social Security Bulletin.*

Figure 3. Maximum Difference in Total Annual Social Security Benefit Between Couples with the Same Combined Earnings



Notes: Combined earnings measured by total Average Indexed Monthly Earnings. Calculation assumes that both spouses are the same age.

Table 1. Actions Required to Eliminate Projected Long-Run Fiscal Deficit

	Timing of Action	Type of Action	Percentage Point Increase in Payroll Tax	Percent Reduction in Scheduled Benefits
1	Permanent and immediate (2011)	Payroll tax increase only	2.15	n/a
		Benefit reduction only: "Immediate benefit only"	n/a	13.8%
		Half payroll tax increase, half benefit reduction: "Immediate half and half"	1.075	6.9%
2	Wait until insolvency (2036)	Payroll tax increase only	4.0 in 2036 to 4.5 in 2085	n/a
		Benefit reduction only: "payable"	n/a	23% in 2036 to 26% in 2085
		Half payroll tax increase and half benefit reduction: "feasible"	2 in 2036 to 2.25 in 2085	11.5% in 2036 to 13% in 2085

Notes: The combined OASI and DI payroll tax rate under current law, including both employer and employee contributions, is 12.4 percent. The long-run deficit projection applies to the next 75 years. The Trustees project that deficits remain after 75 years.
Source: OASDI Board of Trustees (2011).

Exhibit 1: Annual Poverty Levels, Gaps, and Intensity for Social Security Beneficiaries under Current Law and the NCFRR Proposal

	Scheduled	Feasible	Payable	NCFRR, with half benefit	NCFRR, without half benefit
	Level (percent)	*Difference from scheduled benefits (percentage points)*			
2030					
Price-indexed					
Poverty level	9.12	0.00	0.00	-0.02	-0.03
Poverty gap	2.97	0.00	0.00	-0.01	-0.01
Poverty intensity	1.83	0.00	0.00	+0.02	+0.02
Wage-indexed					
Poverty level	14.44	0.00	0.00	+0.06	+0.06
Poverty gap	4.81	0.00	0.00	+0.00	+0.00
Poverty intensity	2.61	0.00	0.00	+0.01	+0.01
2050					
Price-indexed					
Poverty level	6.51	+3.31	+7.31	+0.72	+0.64
Poverty gap	2.39	+1.39	+3.71	+0.29	+0.28
Poverty intensity	3.26	+1.10	+3.08	+0.38	+0.37
Wage-indexed					
Poverty level	16.45	+4.14	+8.25	+1.42	+1.35
Poverty gap	5.79	+2.28	+5.29	+0.55	+0.51
Poverty intensity	3.77	+1.59	+4.03	+0.40	+0.39
2070					
Price-indexed					
Poverty level	4.73	+2.78	+7.29	+1.27	+0.72
Poverty gap	2.03	+1.31	+3.80	+0.55	+0.36
Poverty intensity	4.86	+1.24	+3.65	+0.81	+0.66
Wage-indexed					
Poverty level	18.13	+4.87	+9.57	+2.92	+2.28
Poverty gap	6.50	+2.77	+6.46	+1.30	+0.89
Poverty intensity	4.40	+1.93	+5.00	+0.91	+0.63

Notes: Population includes OASDI beneficiaries under current law and the option. Payable and feasible projections assume that the reductions occur when the combined OASDI and DI trust funds fall below zero (under the 2011 trustees' assumptions). Reductions are applied identically to OASI and DI beneficiaries based on combined income and cost rates (rather than the income and cost rates for the particular trust fund from which benefits are paid).
Source: Author's calculations from DYNASIM3 projections (run 834).

Exhibit 2: Poverty among Social Security Beneficiaries by Time in Poverty under Current Law and the NCFRR Proposal (Price-Indexed Poverty Thresholds)

	Scheduled	Feasible	Payable	NCFRR, with half benefit	NCFRR, without half benefit
	Level (percent)	*Difference from scheduled benefits (percentage points)*			
1961-65 birth cohorts					
Never poor	75.0	-2.1	-5.5	-0.6	-0.6
Transient poor	6.1	-0.8	-1.2	0.0	0.0
Recurrent poor	2.8	-0.2	-0.2	+0.1	+0.1
Chronically poor	16.1	+3.1	+6.9	+0.5	+0.6
1966-70 birth cohorts					
Never poor	76.3	-3.1	-7.7	-0.7	-0.6
Transient poor	5.7	-0.6	-1.3	-0.1	-0.1
Recurrent poor	2.7	-0.4	-0.5	-0.1	0.0
Chronically poor	15.3	+4.1	+9.5	+0.8	+0.7
1971-75 birth cohorts					
Never poor	76.1	-4.1	-9.8	-1.2	-1.1
Transient poor	5.3	-0.2	-0.3	0.2	+0.2
Recurrent poor	2.9	-0.2	-0.2	-0.1	-0.1
Chronically poor	15.8	+4.5	10.2	+1.1	+1.1
1976-80 birth cohorts					
Never poor	75.9	-4.4	-9.7	-1.1	-1.0
Transient poor	5.8	-0.4	-0.9	-0.1	-0.1
Recurrent poor	2.6	-0.2	-0.1	0.0	0.0
Chronically poor	15.7	+4.9	+10.7	+1.2	+1.1
1981-85 birth cohorts					
Never poor	77.4	-4.3	-9.8	-1.6	-1.6
Transient poor	5.6	-0.3	-0.6	0.0	+0.3
Recurrent poor	2.8	0.0	-0.1	0.0	+0.2
Chronically poor	14.3	+4.6	+10.5	+1.5	+1.1

Notes: Population includes OASDI beneficiaries under current law and the option. We define transient poverty as a single spell of one year, recurrent poverty as more than one year in poverty, but no spell greater than two years, and chronically as having at least one spell of greater than two years. Figures may not sum to 100.0 because of rounding. Payable and feasible projections assume that the reductions occur when the combined OASDI and DI trust funds fall

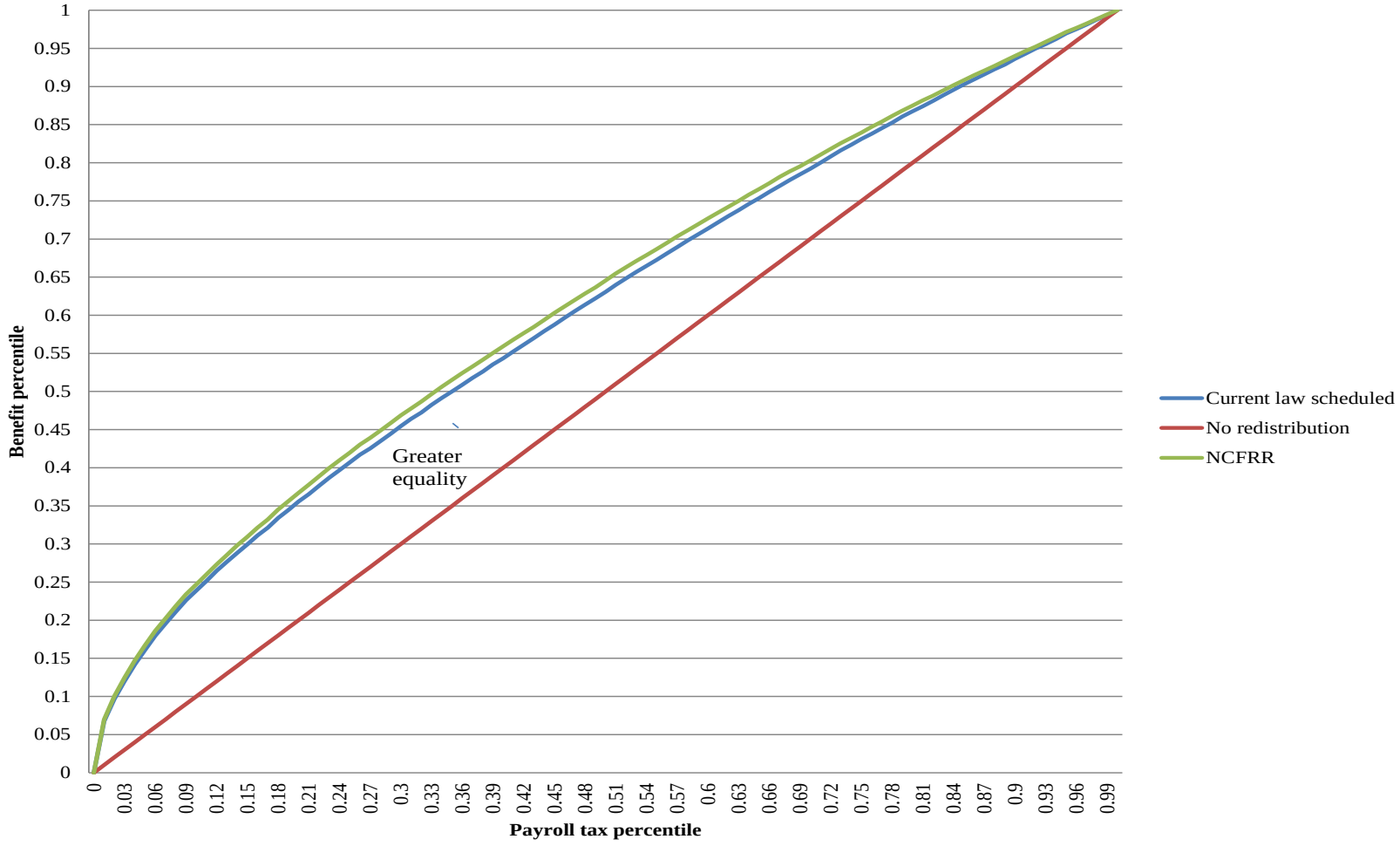
below zero (under the 2011 trustees' assumptions). Reductions are applied identically to OASI and DI beneficiaries based on combined income and cost rates (rather than the income and cost rates for the particular trust fund from which benefits are paid).
Source: Author's calculations from DYNASIM3 projections (run 834).

Exhibit 3: Change in OASDI Benefits' Gini Coefficient: Current Law and the NCFRR Proposal

Scheduled		NCFRR, with half benefit	NCFRR, without half benefit
	Level	*Difference from scheduled benefits*	
2020	0.237	+0.001	+0.001
2030	0.239	-0.002	-0.002
2040	0.240	-0.012	-0.012
2050	0.249	-0.023	-0.027
2060	0.256	-0.029	-0.036
2070	0.260	-0.033	-0.042

Notes: Population includes OASDI beneficiaries under current law and the option, respectively. A decline (increase) in the Gini coefficient implies greater (lesser) inequality.
Source: Author's calculations from DYNASIM3 projections (run 834).

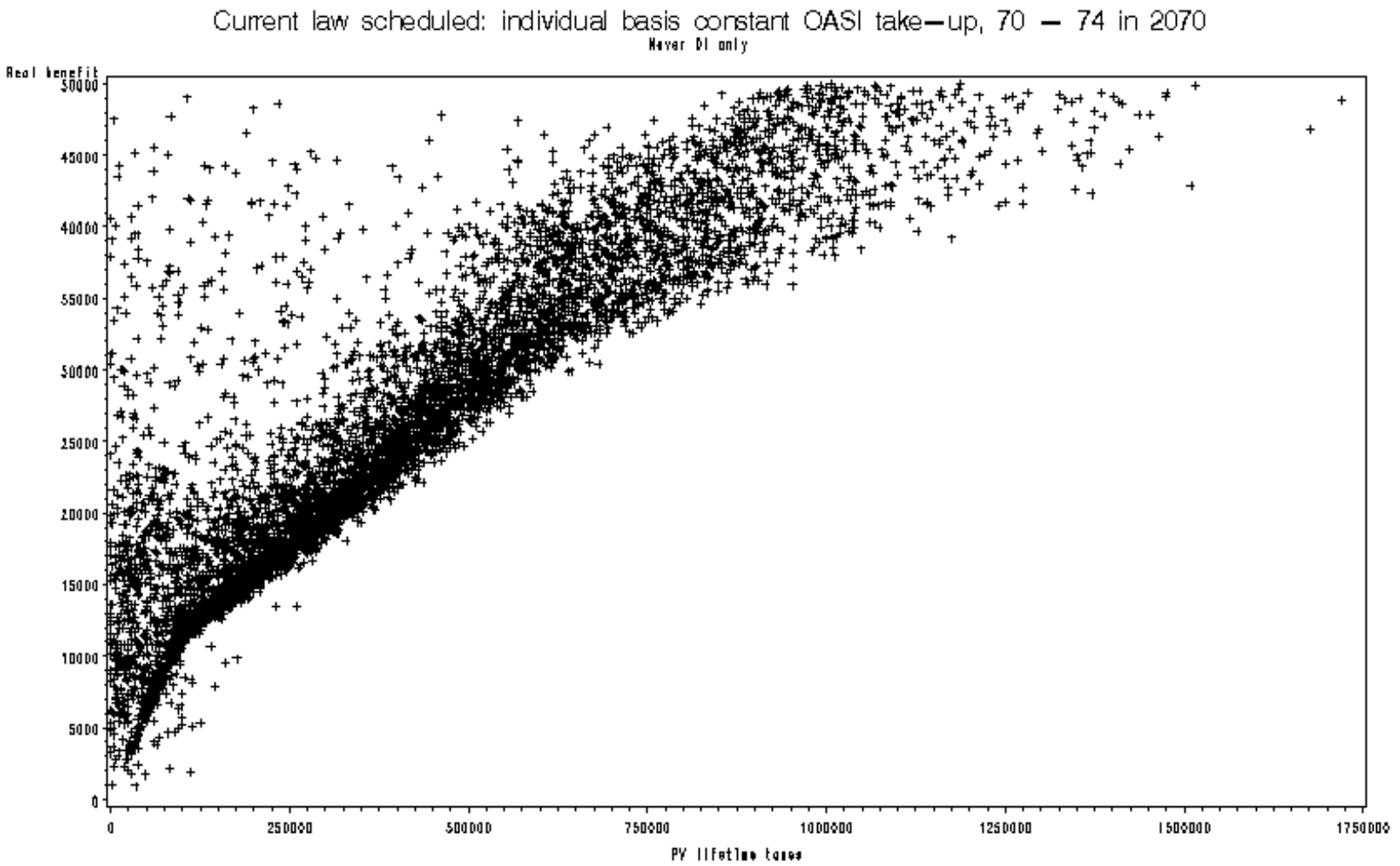
Exhibit 4. OASDI Progressivity Under Current Law Scheduled and the NCFRR Proposal: 1961-1965 Cohorts, Individual Level



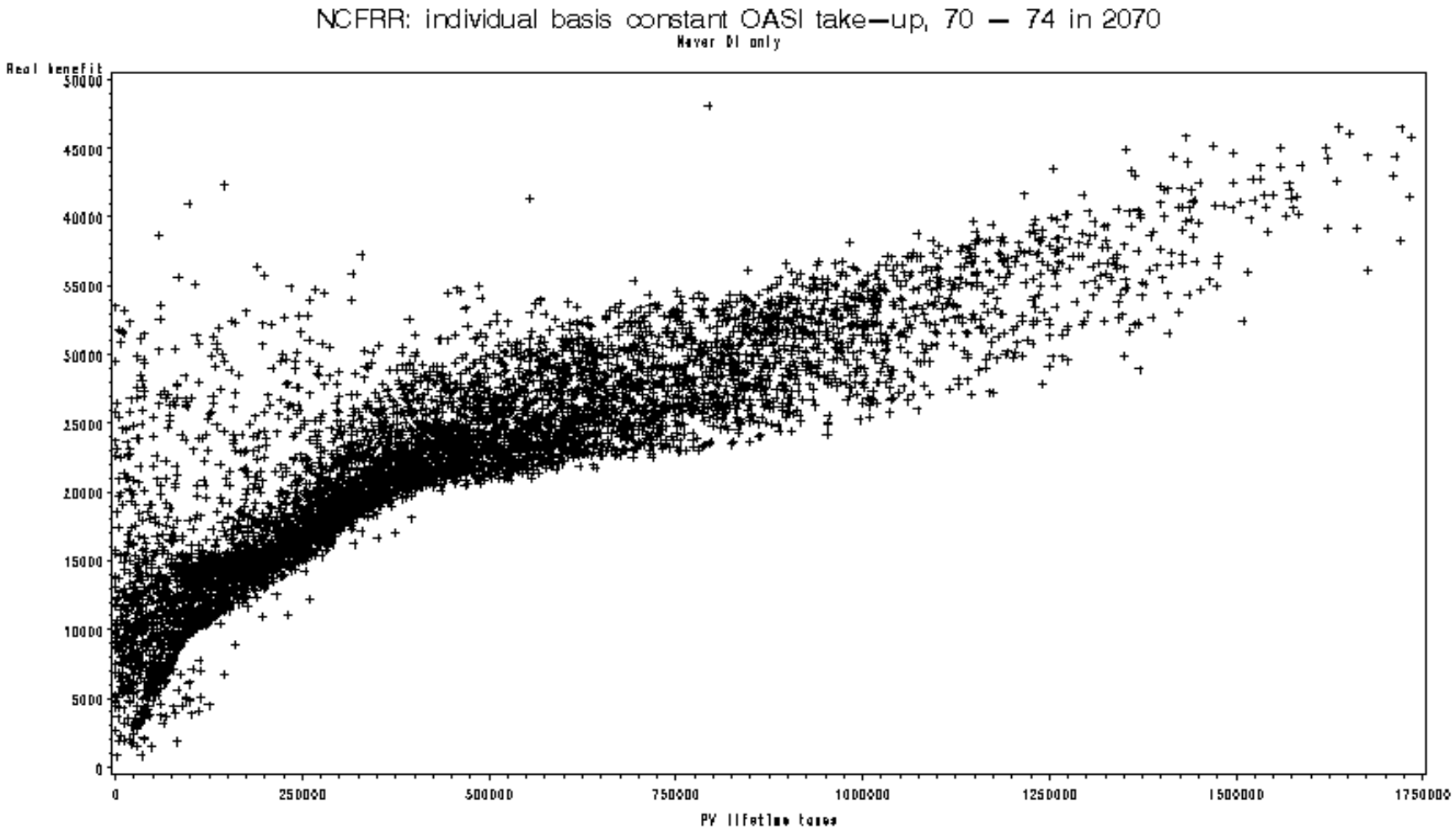
Notes: Drawn from Biggs, Sarney, and Tamborini (2009). Assumes employee bears the burden of the employer portion of the payroll tax.
Source: Authors' calculations from DYNASIM3 projections (run 834).

Exhibit 5. Individual Annual Benefits by Individual Lifetime Payroll Tax, Ages 70 to 74 in 2070

A. Current Law Scheduled



B. NCFRR Proposal



Notes: Assumes employee bears the burden of the employer portion of the payroll tax.
Source: Authors' calculations from DYNASIM3 (run 834).

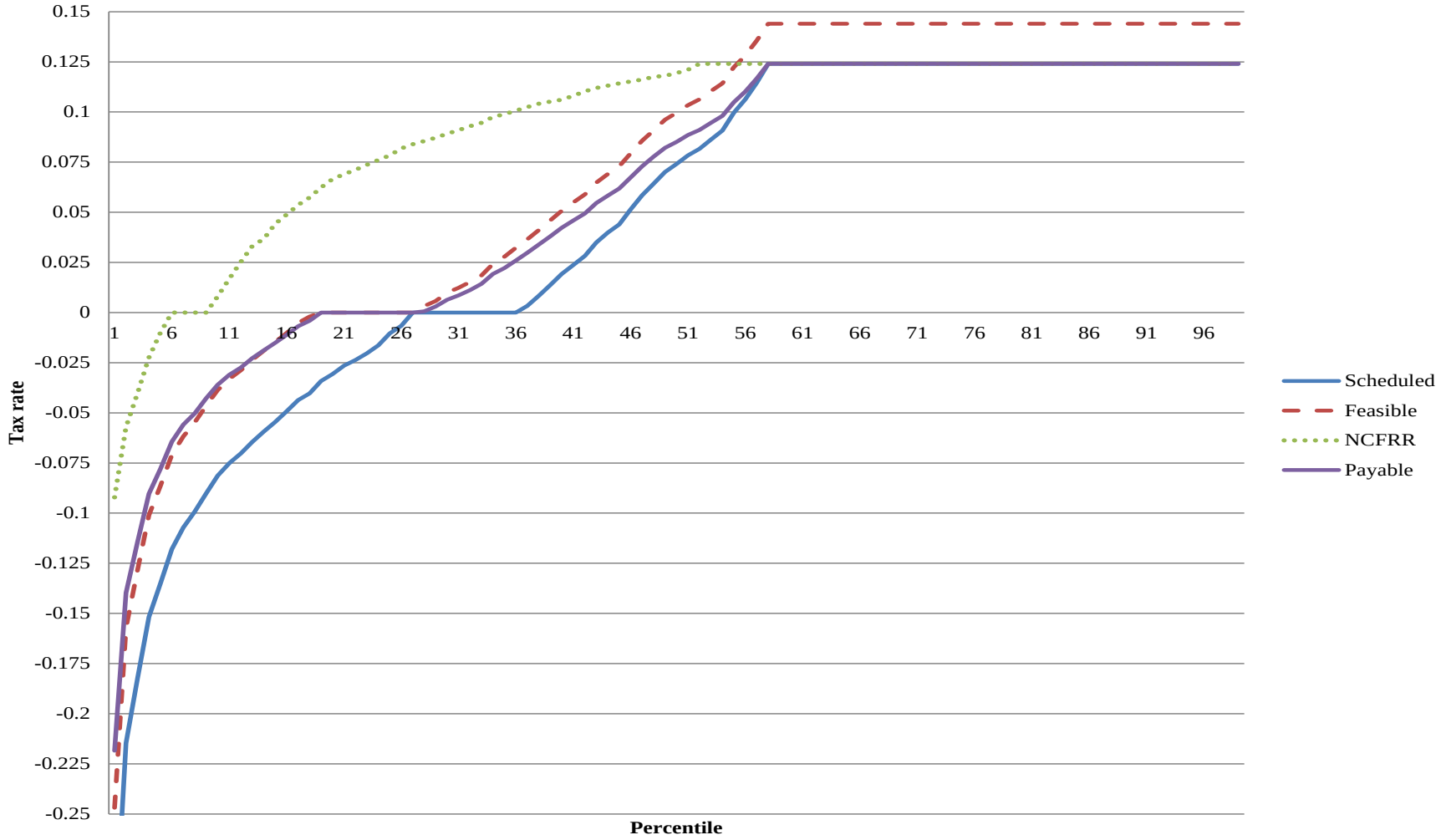
Exhibit 6: Changes in Distribution of Lifetime Non-Contributory Benefit Amounts Relative to Current Law Scheduled by Payroll Tax Paid and Payroll Tax Splits between Spouses under NCFRR Proposal

	Birth cohorts	
	1961-1965	**1976-80**
Lifetime Payroll Tax Paid	*Change in share of distribution to group (percentage points)*	
Lowest quintile	+1.0	+2.8
Second quintile	+0.9	+3.0
Middle quintile	-0.1	+0.9
Fourth quintile	-0.9	-2.4
Highest quintile	-1.0	-4.3
Payroll Tax Split Between Spouses (Share for Lower Earner)		
Never married	0	0
Single earner or very skewed (<10 %)	+1.2	+2.0
Highly skewed (10-19.9%)	-0.8	-1.8
Moderately skewed (20-33.3%)	-0.4	-0.6
Approaching close (33.3-44.9%)	-0.1	+0.2
Fairly evenly split (45-50%)	-0.1	0
Share of Adult Benefits that are Non-Contributory	-5.6	-15.5

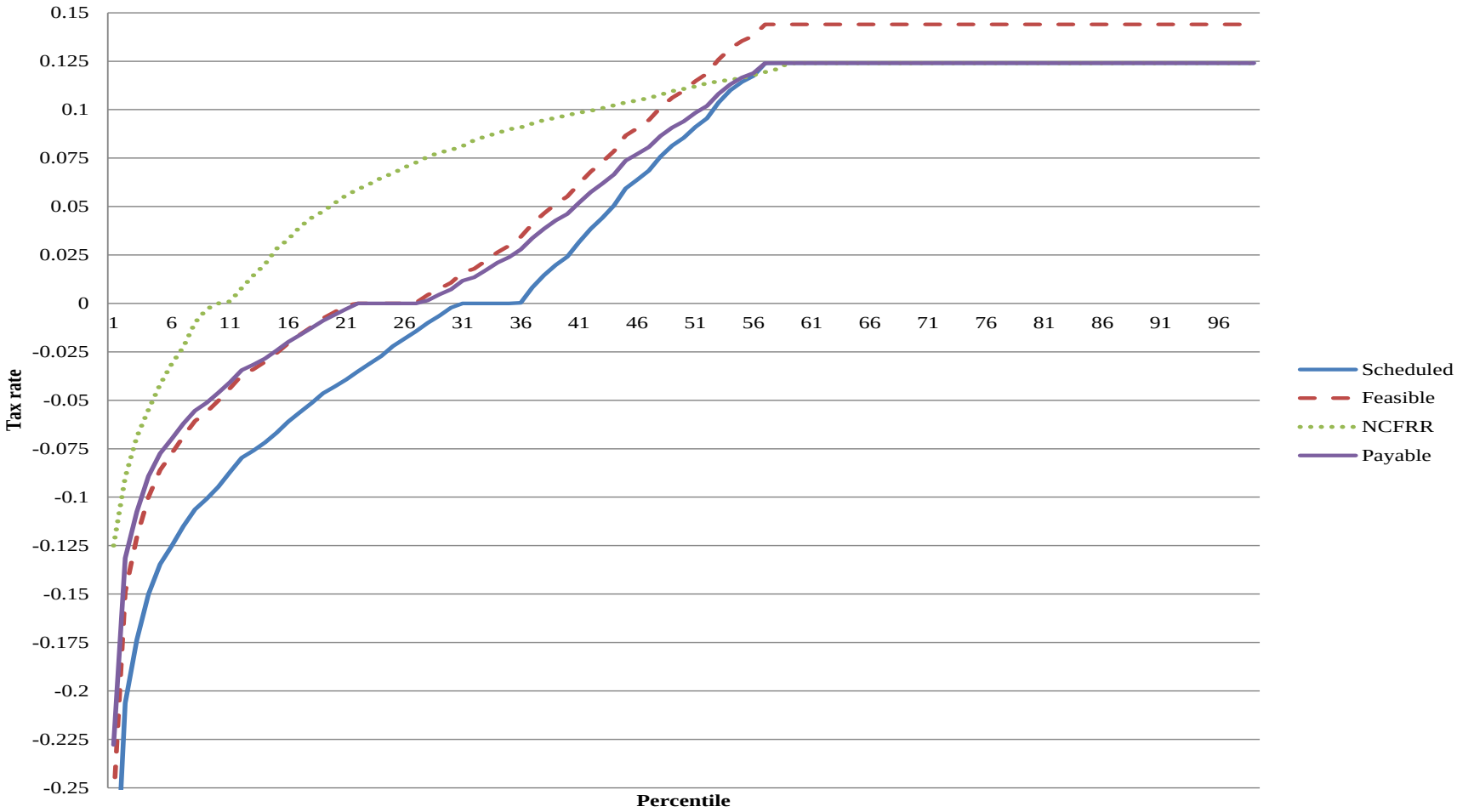
Notes: Payroll taxes are measured on a lifetime basis and shared for couples over the duration of a marriage. Accumulates both payroll taxes and benefits using a 2.9 percent real discount rate. Assumes employee bears the burden of the employer portion of the payroll tax. The term "non-contributory" benefits refers to spouse and survivor benefits and supplement amounts to dually entitled workers.
Source: Author's calculations from DYNASIM3 (run 834).

Exhibit 7. Distribution of Marginal Tax Rate Net of OASDI Benefits at Age 60 for Those Born from 1976-1980 who Never Received DI Benefits

7a. Men who Work at Age 60



7b. Women who Work at Age 60



Notes: Payable and feasible projections assume that the reductions occur when the combined OASDI trust fund falls below zero (under the 2011 trustees' assumptions). Reductions are applied identically to OASI and DI beneficiaries based on combined income and cost rates (rather than the income and cost rates for the particular trust fund from which benefits are paid). Population excludes other-than-legal immigrants. Uses a discount rate of 2.9 percent in computing change in lifetime OASI benefits.
Source: Authors' calculations from DYNASIM3 (run 834).

Exhibit 8: Ratio of Shared Lifetime Benefits to Shared Lifetime Payroll Tax Contributions under NCFRR and Current Law by Shared Work Years: 1971-75 Birth Cohorts

Lifetime payroll taxes and work years	**Scheduled** *Level*	**Feasible** *As a percent of current law scheduled*	**Payable**	**NCFRR**
<$150,000				
<20	2.22	0.92	0.87	1.00
20-29	2.20	0.90	0.84	0.97
30-34	2.46	0.89	0.82	0.98
35-39	1.98	0.88	0.82	1.01
40+	1.74	0.87	0.80	1.03
All	2.21	0.91	0.86	0.99
$200-249,999				
<20	1.31	0.89	0.82	0.91
20-29	1.39	0.90	0.82	0.93
30-34	1.42	0.89	0.81	0.94
35-39	1.53	0.89	0.81	0.94
40+	1.45	0.88	0.80	0.95
All	1.42	0.89	0.81	0.94
$350-399,999				
<20	0.85	0.86	0.79	0.87
20-29	1.11	0.88	0.81	0.87
30-34	0.99	0.88	0.80	0.88
35-39	1.06	0.87	0.79	0.86
40+	1.10	0.87	0.79	0.88
All	1.07	0.87	0.80	0.87
$500,000+				
<20	c	c	c	c
20-29	0.80	0.86	0.79	0.79
30-34	0.83	0.86	0.79	0.80
35-39	0.81	0.86	0.79	0.79
40+	0.87	0.86	0.79	0.80
All	0.85	0.86	0.79	0.80

Notes: c= cell size too small to compute reliably. Accumulates both payroll taxes and benefits using a 2.9 percent real discount rate. Assumes employee bears the burden of the employer portion of the payroll tax. Payable and feasible projections assume that the reductions occur when the combined OASDI and DI trust funds fall below zero (under the 2011 trustees' assumptions). Reductions are applied identically to OASI and DI beneficiaries based on combined income and cost rates (rather than the income and cost rates for the particular trust fund from which benefits are paid).
Source: Author's calculations from DYNASIM3 (run 834).

Selected Studies Table 1. Social Security Adequacy

Author(s) / year of study	Outcome measures, including statistics used	Population and programs (OASDI)	Classifier variables
Favreault (2009)	Share of total benefits; poverty status; near-poverty status (<125 percent of FPL) (compared to scheduled and payable)	2030 and 2050 OASDI beneficiaries	Education, gender, single-parent status, work years
Favreault (2010)	Benefit at or below FPL	OASDI beneficiaries age 64 to 73 in 2004 (1931-40 birth cohorts)	Education, gender, race/ethnicity, nativity, health status, marital history and status, homeowner status, work history, occupation and industry, caregiving history, uncovered employment history
Favreault and Mermin (2008)	Share of total benefits; poverty status; near-poverty status (<125 percent of FPL); median lifetime benefits to lifetime contributions	2038 beneficiaries; 1965-1972 birth cohorts, OASDI	Race/ethnicity, lifetime earnings quintile
Herd (2005)	Distribution of non-contributory benefits; distribution of ineligibles; replacement rates for married couples; probability of benefit increase/decrease; approximate costs	Women beneficiaries reaching age 62 between 2020 and 2030	Asset quartiles, race, marital status, parent status, single parent status, marital status * childbearing within lowest asset quartile
Tamborini and Whitman (2010)	Percent with a benefit change, size of change among those with a change, poverty status, near poverty status (< 150 percent of FPL)	2030 OASI beneficiaries	Education, race/ethnicity, retirement income quintile
U.S. GAO (2001)	Benefit relative to poverty; benefit relative to half median income; poverty status	2020 beneficiaries, 1955, 1970, and 1985 birth cohorts	Benefit quintiles, gender, marital status, race/ethnicity

Notes: FPL=Federal poverty level.

Selected Studies Table 2. Social Security Progressivity, Inequality, and Dispersion

Author(s) / year of study	Outcome measures, including statistics used and computation details	Population and Programs (OASDI)	Classifier variables
Biggs, Sarney, and Tamborini (2009)	Progressivity index (percentiles of the cumulative distribution of benefits related to cumulative distribution of payroll taxes)	1926-2017 birth cohorts, OASI	Survive to 62, never disabled
Coe, Karamcheva, Kopcke, and Munnell (2011)	Redistribution (the difference between the share of total benefits received and the share of total taxes paid) and "effective progression" (the change in the Gini coefficient)	1931-1941 birth cohorts, OASI	Earnings decile (individual and household)
Cohen, Steuerle, and Carasso (2004)	Internal rate of return	1931-1964 birth cohorts, OASI, DI, OASDI, increm-entally	Earnings quintile, education
CBO (2006)	Benefit to tax ratio (net of income taxes paid)	1940s to 2000s birth cohorts	Earnings quintile, benefit type (retired, disabled, auxiliary)
CBO (2010)	Changes to initial benefits, lifetime benefits, lifetime payroll taxes, contrasts scheduled and payable	1960, 1980, and 2000 birth cohorts	Three lifetime household earnings quintiles (highest, middle, lowest)
Coronado, Fullerton, and Glass (2011)	Before and after-tax Gini coefficients, net tax rate (tax minus benefit as a percent of income)	PSID, present 1968-1989, no change in relationship to head	PV of household lifetime earnings
Gustman and Steinmeier (2001)	Rate of return, share of benefits redistributed, Gini coefficient	1936-1941 birth cohorts	Decile of earnings capacity (based on highest observed earnings)

Notes: CBO=Congressional Budget Office; PSID= Panel Study of Income Dynamics; pv=present value.

Selected Studies Table 2. Continued

Author(s) / year of study	Outcome measures, including statistics used and computation details	Population and programs (OASDI)	Classifier variables
Gustman, Steinmeier, and Tabatabai (2011)	Benefit to tax ratio (own and household), rate of return, within-cohort redistribution measure: percent deviation from benefits if the benefit-tax ratio for members of the decile were the same as the benefit-tax ratio for all cohort members	1936-1941 and 1948-1953 birth cohorts	Redistribution measure examined by decile (see above)
Leimer (2004)	Transfers, ratio of benefits to contributions, internal rate of return	Through 1927 birth cohort, OASDI	Gender and race
Liebman (2002)	Internal rate of return, net transfer, lifetime net tax rate; split both benefits and taxes between spouses	1925-1929 birth cohorts, OASI (no early survivors)	AIME quintile, total earnings quintile, education, race/ethnicity
OECD (2007)	Progressivity of a pension program: 1 minus the ratio of the Gini coefficient of benefits to the Gini coefficient of earnings	N/A	
Panis and Lillard (1996)	Real rate of return, net lifetime transfer	1930-1970 birth cohorts, OASI	Earnings, marital status, race
Smith, Toder, and Iams (2003/2004)	Lifetime benefit – lifetime tax as a percent of lifetime earnings (both individual and shared); compares to adjusted annuity (assuming accurate mortality forecast) and unisex annuity	1931-1960 birth cohorts, OASI	Lifetime earnings quintiles, education, race/ethnicity
Steuerle and Bakija (1994)	Real internal rate of return; net transfer as percent of lifetime income; lifetime benefit to tax ratio	1800s to 1985 birth cohorts, OASI	Gender, cohort, one- vs. two earner couple, low, average, high earnings

Notes: AIME=average indexed monthly earnings; OECD=Organisation for Economic Co-operation and Development; pv=present value.

Selected Studies Table 3. Horizontal Equity of Social Security

Author(s) / year of study	Outcome measures, including statistics used and computation details	Population and programs (OASDI)	Classifier variables
Biggs (2009)	Replacement rate, r-squared (from regression relating replacement rate, lifetime earnings)	1940 birth cohort	Lifetime earnings percentiles
CBO (1986)	Pre-and post-change benefits, percent change, percent >= +/- 5 percent change	2030 beneficiaries	Marital status * work years (<30, >=30), marital status * current law benefits
Favreault and Caldwell (2000)	Lifetime transfer	1936-1970 birth cohorts, OASDI	Shared lifetime earnings * lifetime marital experience (never married, > 60 percent single-earner, > 60 percent dual-earner)
Favreault, Sammartino, and Steuerle (2002)	Benefit average, percent change under changes, percent with higher benefits	2040 women beneficiaries plus hypothetical couples	Marital status * lifetime earnings quintile; marital status * age; single vs. dual earners
Favreault and Steuerle (2007)	Changes relative to current law scheduled; ratio of lifetime benefits to lifetime contributions; poverty status (adequacy components)	1960-1980 birth cohorts, 2049 beneficiaries, OASDI (no children's benefits)	Marital status; pv of lifetime payroll tax * share earned by lower earning spouse (categories: <0.10, 0.10-0.199, 0.20-0.333, 0.334-0.449, 0.45-0.479, 0.48-0.50)
Iams, Reznik, and Tamborini (2009)	Percent with benefit changes, size of benefit changes	2030 OASDI beneficiaries ages 62 or older	Marital status, one-earner versus two-earner married couples (if married, in a first marriage): defined by 40 cqs, two-earner couples separate by dual-entitlement status

Iams, Reznik, and Tamborini (2010)	Percent with benefit changes, size of benefit changes	2030 OASDI beneficiaries ages 62 or older	Gender * marital status

Notes: pv=present value, cq=covered quarters (OASDI). See also Herd (2005 in Selected Studies Table 1.

Selected Studies Table 4. Addressing Work Incentives ("Efficiency") in Social Security

Author(s) / year of study	Outcome measures, including statistics used and computation details	Population	Classifier variables
Feldstein and Samwick (1992)	Net marginal Social Security tax rate: difference between the Social Security tax of 11.2 cents per dollar of earnings and the present value of the net benefits to which an additional dollar of earnings entitles the individual	Stylized combinations of economic and demographic traits (36)	Age, income, sex, marital status
Goda, Shoven, and Slavov (2009)	Implicit Social Security tax rates: the increase in the net tax burden from working an additional year as a percentage of the current year's earnings	Stylized workers based on Current Population Survey plus December 2004 beneficiaries (1910-42 birth cohorts)	Average, 10^{th} and 90^{th} percentiles by age
Reznik, Weaver, and Biggs (2009)	Shared internal rate of return; marginal internal rate of return for an extra year of work before retiring; incremental rate of return	62-65 in 2005 and 2035	Sex, work years, earnings quintile
Sabelhaus (2007)	Effective tax rate on earnings from working an additional year: gap between the payroll tax paid and the change in the present value of benefits divided by the level of earnings	1935-39 birth cohorts (focus on those working at least 8 years from ages 45-54)	Sex and selected percentiles (quartiles plus 10^{th} and 90^{th})

APPENDIX I: DISCUSSION OF SELECT CONCEPTUAL ISSUES RELEVANT TO DISTRIBUTIONAL ANALYSIS

AI.1 Unit of analysis: Because Social Security awards benefits both to workers and their dependent spouses and children, analysts may want to examine Social Security benefits and payroll tax contributions—and economic well-being more broadly—on a family basis. This is especially likely when considering prominent adequacy and fairness issues. While relatively straightforward at a point in time, using family as a unit of analysis can be quite challenging because families often change over a lifetime. For example, an individual may be married multiple times during adulthood, in effect having had several families. One strategy for dealing with this in microsimulation analyses is to count the person as single during the points in life when he or she is unmarried but otherwise treat him/her as married, taking into account the present spouse's earnings, income, and other characteristics.

When comparing couples and singles, one needs to decide whether to use an equivalence scale (like the poverty threshold for a family of this type or the square root of the number of people in the family) to take into account the economies of scale that couples can realize. A rich literature details tradeoffs between different equivalence scales (for example, Citro and Michael 1995).

In some circumstances, analyzing outcomes on an individual basis may be more straightforward than family or household examinations. When looking at individuals, additional spouse and survivor benefits that a worker accrues could be considered one's own or one's spouses depending on the calculation. If a spouse's benefits are attributed to a worker, in most case analysts may wish to avoid attributing them to the spouse as well to avoid double counting when adding up benefits across the population.

AI.2 Measuring income and tax incidence: Another question one often asks when designing distributional analyses of government program like Social Security is whether one should use gross (pre-tax) or net (post-tax) outcomes. If one is examining net outcomes, then issues of who bears the burden of different types of taxes become important.

At this point, the tax incidence question appears to be relatively uncontroversial with respect to incorporating Social Security payroll taxes into lifetime measures like the ratio of lifetime benefits to contributions or net lifetime transfer. Most researchers consider that workers bear both the employer and employee shares of the payroll tax; in effect, analysts generally

assume that workers are paid less than they would have been in the absence of the employer's contributions to OASDI.[56] Myers and Schobel (1992) are one exception, but they note that their computations can be simply transformed to include the employee payroll tax.

How the taxation of Social Security benefits should be integrated into distributional analyses is arguably more complicated. The importance of the taxation of OASDI benefits is increasing over time, given that the income thresholds above which benefits are subject to taxation are not indexed for inflation.[57] This increased role argues for including personal income taxes in analyses of changes to OASDI. However, including taxes markedly increases the complexity of modeling Social Security changes. Analysts must come up with a definition of current personal income tax law that remains sensible over a 75-year horizon. In the U.S. context, a large number of current tax reductions are legislated to expire in coming months and years, and there is a broad expectation that some share of them will continue indefinitely. The Congressional Budget Office contends with this policy uncertainty by comparing two projections "current law" and "current policy/extended baseline." The recent Technical Panel report recommends that the OASDI Trustees should similarly consider the difference between these projections (2011 Technical Panel on Assumptions and Methods).[58]

Appendix Figure 1 provides a simple comparison of gross and net benefits under the NCFRR proposal for beneficiaries ages 65 to 69. The analyses suggest that the proposal's benefit reductions are modestly offset by reductions in tax liability that are larger than under current law scheduled for some share of beneficiaries. However, recognizing the complexity of representing the income tax system into the distant future, we have not included these effects in our main analyses.

Another question is whether analyses of lifetime OASDI treatment should incorporate the exemption of the employer portion of the payroll tax from income subject to taxation. Coe,

[56] The literature on payroll tax incidence is somewhat ambiguous, in part because of analytical challenges, but Gruber (1995) finds near full cost shifting from employers to employees.

[57] OASDI Trustees' Report projections suggest that revenue from taxation of benefits will climb from about 1.7 percent of benefit payments in 1984 to almost 5 percent by 2020.

[58] Also, analysts must use care, as part of the revenue from income taxes paid on OASDI benefits is directed to the HI trust fund, not to the Social Security Trust Fund. CBO, for example, does not use revenue from the taxation of benefits that goes toward Medicare in the computation of net benefits. This choice makes sense from a financing perspective and when evaluating the relationship between Social Security benefits and contributions. From the perspective of beneficiary well-being, there may be more of a case for also including the share of benefits that are taxed for HI.

Karamcheva, Kopcke, and Munnell (2011) include the personal income tax deferral due to the preferential treatment of employer payroll tax contributions to OASDI in their analyses of OASDI progressivity. This certainly complicates analyses even further, as it requires extensive information about pre-retirement income from sources other than earnings and family structures (in order to determine filing status and eligibility for important deductions and tax credits, like the Earned Income Tax Credit). Others (Panis and Lillard 1996, Coronado Fullerton and Glass 2011) argue against incorporating this nuance in favor or comparability with past research. Substantively, Coe et al. (2011) conclude that including the employer contributions reduces progressivity, while including taxation of benefits increases it, and that this factor is increasing over time. On net, this leads to a progressive pattern.

AI.3 Interest rate: Most analysts agree that the interest rate one uses when computing lifetime Social Security benefits or payroll taxes should be relatively low, reflecting that low-risk investments are an appropriate analogue. Many studies use the interest rate for the Social Security Trust Fund. In their 2011 report, the OASDI Trustees assume this will average 2.9 percent real over the long run. Among others, Rennane and Steuerle (2011) illustrate how sensitive projections of lifetime measures are to discount rates.

AI.4 Indexing: An important and sometimes controversial question is whether distributional analyses should display Social Security benefits and related outcomes, like poverty status, in wage- or price-indexed terms.[59] The distinction between these two approaches become more important the further into the projection period one looks. Price-indexed quantities are standard for many economic analyses. However, Social Security is designed to replace pre-retirement or pre-disability earnings. Since earnings have historically grown faster than prices, and the OASDI Trustees assume that this difference will continue to average about 1.2 percent per year, using wage-indexed values is more effective for getting a sense of the share of preretirement earnings that the program replaces.[60]

AI.4 Transaction costs: Social Security of course incurs administrative expenses. For the OASI program, transaction costs have historically been low relative to those in the private

[59] This question becomes less important in many analyses which employ ratios (for example, the ratio of benefits under a policy option to current law scheduled), when the units are less of a factor.
[60] One concern with replacement rate analyses per se is that they are limited at indicating how Social Security benefits affect individuals' and families' finances over time because they typically do not account for relative income declines as beneficiaries age.

sector.[61] In 2010, administrative expenses for OASI equaled 0.6 percent of benefit payments (authors' calculations from Social Security Administration 2012, Table 4.A1). The DI program has significantly higher administrative expense, about 2.4 percent of benefit payments (Ibid., Table 4.A2). This differential between OASI and DI is not surprising given the inherent difficulties in determining, monitoring, and periodically recertifying disability, which has subjective dimension and depends on continually changing factors like medical technology and the types of jobs available in the national economy.

Whether and how to integrate these transaction costs is more of an issue for lifetime analyses with a "money's worth" orientation or in cases when a proposal would integrate personal savings account into the system. For distributional analysis of two plans of comparable magnitude, it is likely to be of limited importance unless the program structure would change in such a way as to materially change its likely transaction costs.

AI.6 Classifying the population by economic well-being: One often wishes to examine outcomes for the population having ranked individuals by some measure of well-being. Dynamic microsimulation analyses have used a wide range of classification variables, including lifetime earnings, shared lifetime earnings, current income, and wealth. Gustman and Steinmeier (2001) use "potential" earnings as well, given how the choice not to work among individuals with high earnings potential has an important impact on Social Security redistribution. Each of these measures has strengths and weaknesses. Wealth, for example, may better capture well-being at older ages, but it is notoriously difficult to measure, and arguably more complex to model than lifetime earnings. When administrative payroll tax data are available, earnings are easier to measure reliably.

[61] Congressional Budget Office 2004 provides a description of relevant transaction costs for retirement savings programs.

APPENDIX II: TYPES OF OUTCOMES EXISTING RESEARCH REPORTS

The Social Security Trustees' Report, produced by staff in Social Security's Office of the Chief Actuary (OACT), contains long-run cost forecasts for the U.S. Social Security program. Historically, this report has focused on the program's financial status, with relatively little attention to measures of individual experience. In the most recent Social Security Trustees' Report, the sole measure of distributional outcomes is the replacement rate at time of retirement (but not really in later years of retirement). It is computed for four sets of hypothetical workers: low-earner, medium-earner, high-earner, and maximum-earner by the year the worker attained age 65 in 5-year increments (see OASDI Board of Trustees 2011, Table VI.F10).

OACT periodically publishes notes on its website that supplement the measures in the Trustees' Report with information on additional metrics of individual experience with Social Security. These supplemental metrics include internal rates of return and "money's worth" ratios (for example, Clingman, Burkhalter, Wade, and Chaplin 2010a, 2010b) as well as illustrative benefits (Clingman, Burkhalter, and Chaplin 2011). In computing these outcomes, OACT uses hypothetical workers with scaled earnings profiles. The analysts produce estimates for a range of single-earner couples and a range of dual-earner couples with different earnings splits between spouses. When computing internal rates of return and money's worth ratios, OACT analysts estimate scheduled benefits plus two counterfactuals: payable benefits and the increased payroll tax option. OACT uses this strategy when analyzing the NCFRR proposal (Goss 2011).

Starting in 2003 and 2004, CBO began producing forecasts of long-run Social Security costs that were independent of—though certainly informed by—SSA projections in the Trustees Report. Relying more on microsimulation results, CBO's report on Social Security financing has historically had more of a distributional focus than the Trustees' Report. For both the scheduled and payable options, it includes median initial benefits and replacement rates, by cohort, gender, and lifetime earnings quintile (typically showing three quintiles: the highest, lowest, and middle); lifetime benefits, lifetime taxes, and their ratio. The CBO reports present results separately for retired workers and disabled workers. CBO analysts present all key quantities net of taxation of benefits. In their paper on options that would improve Social Security financing, researchers from the CBO present *change* in median initial benefits, lifetime benefits, and lifetime taxes by 10-year birth cohort, showing results for three quintiles (highest, lowest, and middle).

A third U.S. group, SSA's Office of Retirement Policy, also produces distributional—but not cost—forecasts of changes to Social Security.[62] This group uses Modeling Income in the Near Term (MINT), a dynamic microsimulation model developed by SSA with assistance from researchers from the Urban Institute, Brookings Institution, and RAND, to produce confidential policy analyses for lawmakers and others (for information on the most recent release of MINT, see Smith et. al. 2010). In addition, MINT analyses for prominent provisions to change Social Security are available to the public on SSA's website (Social Security Administration 2011). These distributional analyses include a wide range of cross-sectional outcome measures, including medians of both individual benefits and household income. MINT tables present the percentages of beneficiaries changes affect, while special tabulations provide projections of the sizes of changes among those a policy change affects. The cross-sectional simulation results are typically juxtaposed at three points in time: 2030, 2050, and 2070. In these various tables, individuals are classified by gender, education, household income, lifetime earnings, marital status, race, and type of benefit (retired worker, survivor, disabled worker, spouse, dually entitled survivor, dually entitled spouse). Some policy briefs that use MINT projections of policy changes also include projections of poverty status (for example, Olsen 2008, Sarney 2008, Springstead 2010, 2011). Several researchers from various Social Security offices have also published articles about proposals to change Social Security in academic journals and similar venues using MINT projections (for example, Iams, Reznik, and Tamborini 2010; Tamborini and Whitman 2010), as have some researchers from outside SSA (Reno and Walker 2011).

Two other government groups—the United States Government Accountability Office (GAO, formerly known as the General Accounting Office) and Congressional Research Service (CRS)—have also produced distributional analyses of prominent proposals to change Social Security.[63]

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[62] Canada has historically had a similar division of responsibilities for analyses of its public pension system, with separate actuarial and distributional groups. The report on the actuarial status of the Canada Pension Plan describes individual beneficiary experience with the system using a single lifetime measure, the internal rate of return by birth cohort (Office of the Chief Actuary, Office of the Superintendent of Financial Institutions Canada 2010, p. 74). For many years, Canadian analysts prepared supplemental and consistent distributional pension projections using the DYNACAN model. While most of these analyses were confidential, the tables had similar features to those used in MINT analyses and included winners and losers with average sizes of benefit changes by beneficiary type (Cloutier 2007). The Canadian government suspended this distributional modeling effort in 2009.

[63] GAO has also used MINT as well as a series of models that the Policy Simulation Group developed, including GEMINI, for distributional analyses (see, for example, U.S. GAO 2001, 2004). Cohorts and lifetime earnings quintiles are the primary classifiers in these analyses; select analyses also include gender, marital status, and

Some non-government researchers have also considered the effects of Social Security changes using dynamic microsimulation and other empirical strategies. We discuss much of this literature and these analyses along with each type of measure suggested above, but here point out a few prominent microsimulation efforts. Prior analyses by Urban Institute authors report cross-sectional outcomes (for example, 2030, 2050, and in some cases 2070), including distributions of benefit changes, and lifetime benefit to payroll tax ratios for selected birth cohorts (for example, Urban Institute 2009; Favreault and Karamcheva 2011).[64] Gokhale (2010) juxtaposes a number of Social Security proposals developed by policy analysts with different perspectives on the relative weight that should be placed on payroll tax increases compared to benefit reductions using a model called Demographic and Economic Microsimulation, or DEMSIM. His outcome measures include the present value of Social Security benefits and wealth.[65]

race/ethnicity. The CRS analyses use DYNASIM. Analysts produced most of these simulations in response to confidential Congressional requests, but some were distributed in reports that are publically available (see, for example, Haltzel et al. [2005], which is currently posted on the Senate Aging Committee's website). Similar to the MINT projections, these analyses focus on distributions of projected benefit changes—median change by age and benefit type, plus distribution of changes of various sizes by income quintile. They report exclusively cross-sectional measures (2035).

[64] These projections bracket policy options with scheduled and payable benefit outcomes. Classifiers in these analyses include age, disability status, lifetime earnings, and education.

[65] He also compares to the payable and scheduled counterfactuals. Population classifiers include birth cohort, gender, race, and lifetime earnings (specifically, whether above or below median).

APPENDIX III: DISCUSSION OF SELECT TECHNICAL ISSUES RELEVANT TO DISTRIBUTIONAL ANALYSIS

AIII.1 Group versus Individual: Because dynamic microsimulation models allow users to track a full distribution of specific individuals for their entire lifetimes, many complications arise that tend not to be issues in simpler analyses based on representative workers. When producing, for example, projections of ratio between current law and an alternative for the values for a population subgroup (or cell), say, married men, analysts must weigh whether to display the individual experience or the aggregate experience—or perhaps both. For example, the ratio of the mean benefit under current law to the mean benefit under the option could be computed as all the married men's benefits under the option divided by all the married men's benefits under current law or as the average when this ratio is computed separately for every married man in the population. Our earlier paper describes how the ratio of means can differ markedly from the mean ratio (and certainly analogous issues can arise for medians and other calculations) (see the Appendix in Favreault and Karamcheva 2011). When looking at the average of the individual values, there is often more volatility and extreme cases are more prevalent than when examining aggregate group experience.

AIII.2 Effects of Outliers: Outliers can distort mean calculations. An outcome like the ratio of lifetime benefits to lifetime contributions is a classic example given that some individuals with minimal payroll tax contributions can receive very high lifetime Social Security benefits, for example as spouses or survivors.[66] If one includes a person with this profile in the calculation of a subgroup mean, it can greatly influence the estimate for the entire group. Using medians rather than means for a subgroup helps to address this issue, as can caps (for example, setting to a maximum value that reflects a very high return but is below the observed maximum). However, for many outcomes of interest like a poverty rate, projected medians are zero for most subgroups. So displaying percentiles more broadly (and often cutting off the display at a relatively high percentile, like the 95^{th} or 99^{th} percentile, rather than the maximum) is one useful strategy for contending with these potential distortions.

AIII.3 Temporary Changes in a Cross-Sectional Context: Transitory benefit changes pose additional challenges for presenting a Social Security proposal's distributional effects at a

[66] Indeed, on an individual basis some beneficiaries may make zero contributions, rendering the computation undefined.

point in time, though such issues often become unimportant when one is using lifetime measures. Some proposals to alter Social Security, for example any increase in the full retirement age would, absent additional changes, simultaneously change whether the RET would affect certain individuals' benefits. Individuals the RET does not affect under current law may indeed feel effects under an option, and as a result they may appear to become non-beneficiaries or receive very low benefits during some of their late-career working years. When they stop working, their benefits may then increase as a consequence of the recomputation of the actuarial adjustment, leading them to appear as if they have gained under an option that should have exclusively caused losses. Analysts' options for dealing with these anomalies include employing sensitivity analyses, placing greater focus on lifetime measures, excluding beneficiaries the RET affects, or de-emphasizing outcomes during years when RET is most likely to be affecting beneficiaries (i.e., before full retirement age under the option).

Analogously, the NCFRR proposal includes a provision to allow individuals subject to increases in the retirement age the option to claim half their benefit before they reach the new early eligibility age. Like the RET, the benefit is designed to be roughly actuarially neutral (because benefits are offset by an adjustment to actuarial reduction factor), so the choice to claim a half benefit has limited effect on average outcomes when making a lifetime benefit calculation. However, in cross-sectional analyses researchers must choose whether and how to include these beneficiaries. Depending on presentation choices, a distributional table could show very different effects. For example, those who claimed benefits under the provision might appear in the table when they claim, pulling down the mean, but not when they are prohibited from claiming (so the mean may increase, because these individuals on average have lower lifetime earnings than non-claimants). Using these choices in tandem leads to subgroups appearing worse off when they have more options, options which many would likely value highly (Favreault and Karamcheva 2011). Again, sensitivity analysis is a strategy for coping with this type of complication. We thus show projections both with and without the optional half benefit in Exhibits 1 through 3.

AIII.4 Defining the Table Universe and Shifting "Beneficiary" Populations: Examples like the NCFRR half benefit and analogous issues like changes in whether the RET applies to a subset of beneficiaries underscore the importance of who should be included in distributional tables. The choice between those who were eligible for benefits under current law or those who would be eligible under *both* current law and the option is important. For example, when an

individual is newly rendered eligible for a benefit because of a change to Social Security, his/her benefit may be significantly below the average, artificially lowering average or median benefits and making a proposal that expanded eligibility appear to make the population worse off overall. At the same time, the fact that someone can no longer collect benefits at a point in life when they would prefer to collect them (for example, due to an increase in the EEA) is relevant to their economic well-being and should be reflected in some way. Similarly, those who collect benefits early may be lower lifetime earners, so excluding them could cause an appearance of relative improvement. The NCFRR's proposal to expand OASDI coverage to newly-hired state and local workers poses analogous complications. Some newly-covered state and local workers will enter the beneficiary population.[67] In all these cases, a common concern is that changes in the composition of the beneficiary population may disproportionately affect measures of central tendency of the proposal's impact.

If one is computing measures that also take into account payroll taxes, then likely one does not want to restrict the sample to beneficiaries, as those who do not survive to receive benefits or who never become insured (because of insufficient OASDI coverage) make payroll contributions and therefore the program has affected them. Excluding them is problematic, as this is an important aspect of how the insurance program works.

Another important issue is whether the OASDI beneficiary population is the true population of interest for a distributional analysis. Research shows clearly that the non-beneficiary population in the U.S. is far more vulnerable to poverty than the beneficiary population (for example, Whitman, Reznick, and Shoffner 2011). If one's main interest is the effect of a proposal on Social Security, restricting the sample to beneficiaries is sensible. If an analyst's main interest is the effect on overall poverty for the aged and disabled, then he or she may need to include non-beneficiaries in the sample as well.

AIII.5 Using a row variable to classify individuals or households by earnings: Another technical issue that arises is how one should define statistics like percentiles when using them as classifiers in distributional tables. One could, for example, define earnings quintiles for the entire beneficiary population, for the entire U.S. population, or for OASDI beneficiaries on a cohort-specific basis. Each approach answers different questions. Cohort-specific measures can

[67] Most would have already been projected to eventually become beneficiaries, either through coverage in their own right from other, covered jobs that they held at other points in life or as spouses/survivors. The Windfall Elimination Provision and Government Pension Office are likely to affect some of these workers.

help to disentangle age, cohort, and phase-in effects. Similarly, questions arise about how to classify the earnings histories of disabled workers. One could compute them analogously to the AIME formula, using fewer computation years. Alternatively, one could use the same accounting period as for other beneficiaries. Neither is inherently superior—they answer different questions from differing perspectives (Toder 2008).

AIII.5. Presenting uncertainty and behavioral response: In its recent report, the Technical Panel on Assumptions and Methods (2011) discussed presentation of uncertainty as an area in which the OASDI Trustees' Report could be improved. Both the Congressional Budget Office and OACT at SSA use stochastic simulation as a key way to present uncertainty for the current law OASDI baseline. Sabelhaus and Topoleski (2007) highlight the importance of state-dependence in policies, and how this interacts with uncertainty. The Social Security Trustees' Report additionally uses high, medium, and low alternatives that have been subject to some criticism.[68] The Trustees' Report further includes sensitivity analyses where one parameter at a time is modified in an appendix.

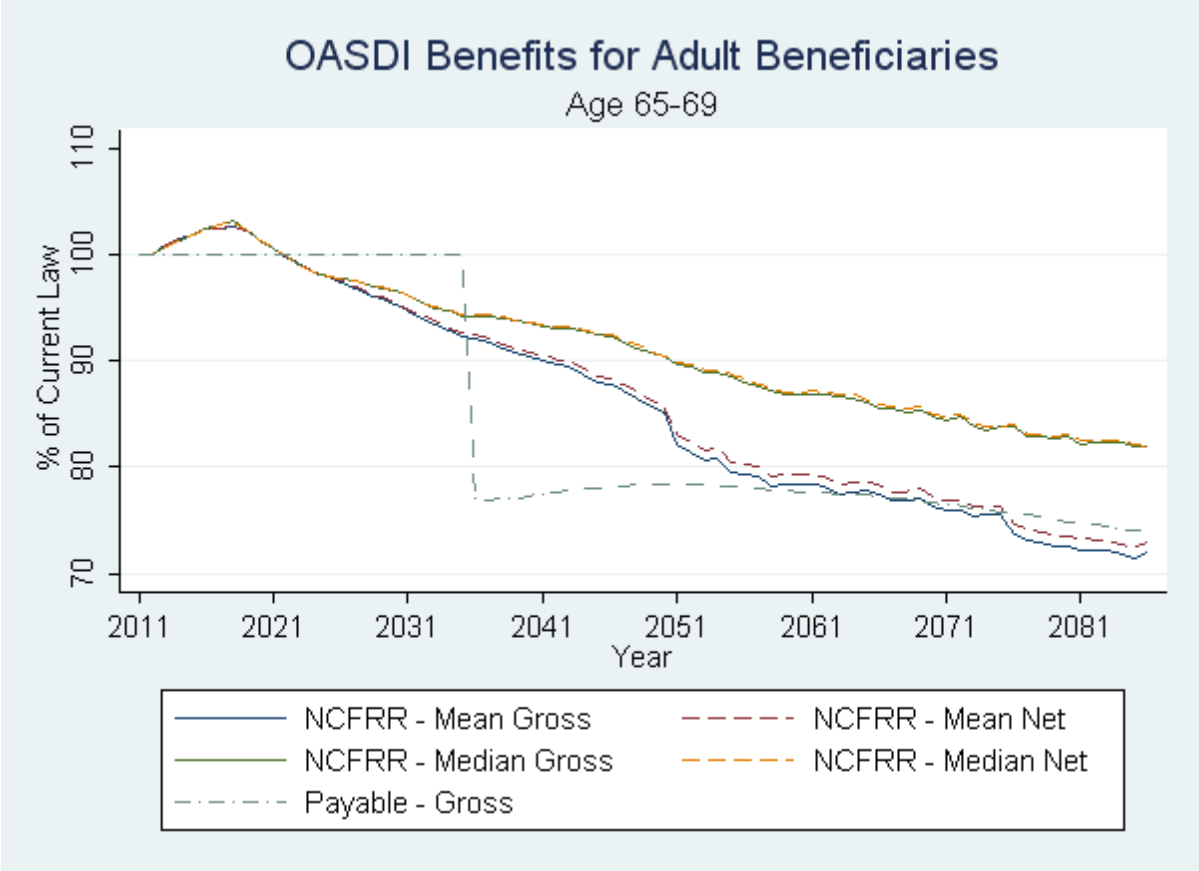
Uncertainty under a policy option is often even more complex than making a current law forecast. Besides the baseline uncertainty in how the world will change, there are also issues of how beneficiaries will change their work, saving, and benefit claiming behaviors. When policies are changing in ways that are unprecedented, there may be little data from which to estimate a response or unanticipated consequences. There is frequently controversy on whether to use static or dynamic scoring in tax policy analysis.

Researchers frequently use sensitivity analysis to contend with these complications. For example, we display NCFRR results with and without the half benefit in our adequacy analyses. We recognize, however, that this is just one small component of the projections' uncertainty.

[68] The concern stems from the underlying assumption in this scenario that all the high and low assumptions could occur simultaneously. (See 2011 Technical Panel on Assumptions and Methods for discussions.)

APPENDIX FIGURES

Appendix Figure 1: Comparison of Pre- and Post-Tax OASDI Measures under the NCFRR Proposal



Source: Authors' calculations from DYNASIM3 (run 834).

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