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The Impact of a Social Security Proposal for "Catch-Up" Contributions

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Abstract

Social Security "Catch-Up" contributions would allow workers to contribute an additional 3.1 percent of salary, starting at age 50, in return for enhanced benefits. We construct an intertemporal optimization model of asset accumulation and decumulation – incorporating interactions between retired worker, spousal, and survivor benefits – and show that for plausible rates of return, risk aversion, and mortality assumptions, even high lifetime earners would benefit from participation and prefer the program to commercial annuities. The program would reduce the Social Security shortfall in the short run and be approximately actuarially neutral over 75 years. The program would modestly reduce defacto elderly poverty.

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I. INTRODUCTION

Social Security is the fundamental basis of Americans' retirement security, providing universal coverage, progressive benefits, lifetime inflation-indexed income, and low administrative costs. But only half of working age households are on track to maintain their standard of living in retirement, down from 70 percent in 1986 (Munnell, Chen, and Siliciano, 2021). In theory, employer sponsored retirement plans and private savings should have filled the gap; but wealth accumulations in employer sponsored retirement plans fall far short and most Americans don't save outside of tax-preferred plans. Many mid-career workers would have to save up to an implausibly large 41 percent of their incomes to replace pre-retirement income (Munnell, Golub-Sass, and Webb, 2011).

This study evaluates a proposal aimed to help mid-career workers' retirement wealth. At age 50, workers would be defaulted into Social Security "Catch-Up" contributions of 3.1 percent of salary, 50 percent of their existing contributions, and credited with a 50 percent bonus in their earnings records for the years they participated. For example, a worker earning $50,000 a year would be credited with earnings of $75,000 instead of $50,000, and a worker earning $200,000 would be credited with earnings of $199,350 (1.5 times the 2019 taxable maximum of $132,900) instead of $132,900. The Primary Insurance Amount (PIA) – the retired worker benefit payable at their FRA – would be based on earnings inclusive of Catch-Up contributions, so that maximum benefits a worker could receive would increase.

The proposal leverages the progressivity of the Social Security benefit formula to target low and moderate earners since those Catching-Up by contributing more and earning $132,900 receive larger benefits than those earning $199,350 and not using Catch-Up contributions. Neither the taxable maximum, employer contributions, and

the earnings tax max are increased. The proposal would leave Social Security's 75-year actuarial shortfall unchanged and significantly reduce the 25-year shortfall, reflecting the progressivity of the benefit formula.

The AARP selected the proposal for further development and financial support as part of its 2016 "Innovation Challenge." The output was a study that evaluated the attractiveness of Catch-Up contributions to single individuals (Ghilarducci et al., 2018). But most people enter retirement as part of a married couple. Since Social Security provides retired worker, spousal, and survivor benefits, the Catch-Up program affects couples and singles differently due to the impact of Catch-Up contributions on spousal and survivor benefits. Although the Social Security system has been gender-neutral since 1983, most wives in the cohorts approaching retirement (Butrica and Smith, 2012) earned less than their husbands and will switch from a retired worker to a survivor benefit on widowhood. And, some lower earning spouses, mostly women, top-up their retired worker benefit with a spousal benefit.

This study evaluates the benefit of Catch-Up contributions to married couples, compares results with those for singles and considers whether the program might suffer from adverse selection, with high income and high mortality households and secondary earners opting out. The study constructs an intertemporal optimization model of the participation, savings, and asset de-accumulation decisions faced by married workers. The study calculates "equivalent contribution rate" (ECR), the contribution rate at which a worker is indifferent between participating and not participating. When the ECR exceeds 3.1 percent, a worker is better off participating. The study shows that, taking account of the additional longevity insurance purchased with Catch-Up contributions, the program would benefit both high and low earners and members of high mortality groups, and is also more attractive than commercial

annuities (Poterba and Warshawsky, 1999). The program is somewhat less attractive to a shrinking minority of secondary earners with low earnings relative to those of their spouse.

The study shows that Social Security's actuarial shortfall can be closed with contribution increases, rather than benefit cuts. The study calculates the optimal contribution rate by household type to show, at the margin, higher contribution rates would increase lifetime expected utility even among high lifetime earners, who now get lower returns from Social Security than low and medium earners. With minor exceptions, for plausible preference parameters and assumed rates of return on financial assets, the optimal Catch-Up contribution rate for both married and single households at all earnings levels exceeds our proposed 3.1 percent.

We distinguish our plan from proposals to carve – out individual accounts out of Social Security (Weller, 2000), increasing the Full Retirement Age, raising taxable maximum earnings, and means testing benefits.

The next section describes Social Security. The third section describes four "yardsticks" to evaluate the benefit of the Catch-Up plan. The fourth section presents results; the fifth discusses and concludes.

II. CURRENT LAW STRUCTURE OF SOCIAL SECURITY BENEFITS

Individuals can claim retired worker benefits at any age from 62 to 70, subject to an actuarial adjustment if not claimed at their Full Retirement Age (FRA). The Primary Insurance Amount (PIA) is calculated by wage-indexing lifetime earnings to age 60, calculating Average Indexed Monthly Earnings (AIME), the monthly average of the highest 35 years wage-indexed earnings, and then applying a three-part benefit formula that gives higher replacement rates to lower lifetime earners. Under the Catch-Up proposal, the calculation of AIME would include the 50 percent bonus,

where applicable. Catch-Up contributions will increase retired worker benefits provided the Catch-Up year counts as one of the 35 highest earning years. The progressive PIA formula causes higher earners to receive smaller increases in benefits per dollar of increase in AIME.

Spouses of retired workers can claim spousal benefits, provided they have turned age 62 and their spouse has claimed their own retired worker benefit. At their FRA, spouses are entitled to benefits of one half of their spouse's PIA. The benefits of spouses claiming early are actuarially reduced, by 30 percent for those claiming at age 62 but do not increase if the spouse delays claiming beyond the FRA.

If a spouse is entitled to both a spousal and a retired worker benefit based on their own contributions, their retired worker benefit is paid first. If the spousal benefit is higher than their own retired worker benefit, the spouse will get a combination of benefits equaling the higher spousal benefit.

Catch-Up contributions will therefore increase spousal benefits, but only of spouses with very low or zero lifetime earnings whose spousal benefit exceeds their own retired worker benefit. Since more married women now work, spousal benefits have become a shrinking share of household retirement income. Less than a third of Early Boomer women born 1948-53, who became eligible for benefits between 2010 and 2015, were entitled to spousal benefits (Sass, 2016).

Surviving spouses can also claim a survivor benefit based on their late spouse's earnings record if that exceeds their own retired worker benefit. The amount of the survivor benefit depends on their claim age and the deceased spouse's monthly benefit. Surviving spouses without dependents can claim as early as age 60 to receive reduced benefits according to the number of months before their FRA, subject to a minimum monthly amount of 71.5 percent of the deceased worker's PIA. Surviving

spouses with dependents can claim at any age. Surviving spouses who claim at or after their FRA receive an amount equal to 100 percent of their deceased spouse's benefit, subject to a minimum benefit of 82.5 percent of the deceased spouse's PIA.

Although the survivor benefit is gender neutral, most claimants in this cohort are women, reflecting women's lower lifetime earnings and lower retired worker benefits, their greater longevity, and gender age differences within marriage. Among those over age 65 in 2014, 10.4 percent of men and 34.0 percent of women are surviving spouses (authors' calculations from the Health and Retirement Study). For typical couples, the husband's Catch-Up contributions will increase his retired worker benefit and his spouse's survivor benefit, increasing the household's return to his Catch-Up contributions. In contrast, since a typical married woman's Catch-Up contribution would increase her retired worker benefits only until she collects a survivor benefit, her expected rate of return on Catch-Up contributions and the value she places on Catch-Up contributions would be lower than for a single woman. But some married women may still earn a higher return on Catch-Up contributions than their husband, due to their lower earnings.[1]

III. FOUR WAYS TO EVALUATIE THE BENEFITS OF CATCH-UP CONTRIBUTIONS

We use four indicators or "yardsticks" to evaluate the benefit of Catch-Up contributions: 1) the effect on initial income, 2) annual rate of return on Catch-Up

[1] We note two additional interactions. First, the Social Security earnings test reduces the retired worker, spousal, and survivor benefits of claimants who have not yet attained their FRA at a 2018 rate of a $1 dollar reduction in benefits for each $2 that earnings exceed $17,040. Second, surviving spouses who claim survivor benefit can later claim a retired worker benefit based on their own record, without any actuarial reduction. Depending on labor market earnings, mortality beliefs, and the relative amounts of the survivor and retired worker benefit, the optimal strategy for some surviving spouses may be to claim survivor benefit as early as possible and to switch to retired worker benefit as late as possible.

contributions, 3) willingness to pay for participation in the program, and 4) a comparison with 401(k)s, IRAs, and voluntary annuitization.

First, the impact on initial benefits and replacement rates. The replacement rate denominator equals AIME and the numerator equals PIA, and we sum the husband's and wife's AIME and PIA to arrive at a household level replacement rate. This metric omits the effect on a surviving spouse and the additional longevity insurance provided by Catch-Up contributions but may be the most salient to households contemplating participation. We report benefits in age-66 dollars. When calculating replacement rates, we follow convention and divide PIA by AIME.

Even among workers who are not liquidity constrained, few delay claiming until what appear to be optimal ages (Sun and Webb, 2011). We decided against assuming that households select claim ages optimally to maximize expected lifetime utility as this would necessitate making assumptions about the disutility of work. Instead, we assume both husband and wife claim retired worker benefits at their FRA, which is slightly later than the current average claim age of 64 (Munnell and Chen, 2015).

Our second yardstick is the expected rate of return on Catch-Up contributions. This yardstick takes account of their impact on spousal and survivor benefits. Although surviving spouses with dependents can claim survivor benefits at any age, we assume all surviving spouses claim benefits on the death of their spouse or at age 66 if later. Our assumption avoids modeling eligibility for survivor benefits among surviving spouses under age 60, the impact of the Social Security earnings test on surviving spouses who have not yet retired, and evaluating alternative sophisticated claiming strategies that few people likely utilize, for example claiming survivor

benefit immediately upon the death of their spouse and switching to retired worker benefit at age 70.

Rate of return calculations understate the value of Social Security Catch-Up contributions because they disregard the value of the insurance the program provides against longevity and labor market risk. Households drawing down financial assets in retirement must trade-off the risk of outliving their wealth against the cost of unnecessarily restricting their consumption. Social Security solves this problem by providing a lifetime income, insuring households against the risk of outliving their wealth. Theoretical calculations show that for plausible preference parameters the value of longevity insurance is substantial for single individuals and somewhat lower for married couples, due to longevity risk pooling within the household, albeit still significant (Brown and Poterba, 2000). For plausible preference parameters, the marginal value of additional longevity insurance declines as the share of pre-annuitized wealth increases.

Therefore, our third yardstick is the "equivalent contribution rate" (ECR), the contribution rate at which a risk-averse household facing an uncertain lifespan would be indifferent between participating and not participating in the Catch-Up program. When the ECR exceeds 3.1 percent, the household is better-off participating, and when the ECR is less than 3.1 percent, the household is better-off opting out of the Catch-Up program. We assume at this point that the purchase of a commercial annuity is not an option.

We calculate the ECR by constructing an intertemporal optimization model in which risk-averse households facing mortality risk choose optimal levels of consumption each year. Individuals claim Social Security retired worker, spousal, and if applicable, survivor benefits at age 66. We calculate the contribution rate at which

the household is indifferent between participating and not participating in the program. Our calculations disregard lifetime income from defined benefit retirement plans. These plans are disappearing in the private sector, and annuitization is both rare and offered on unfavorable terms in 401(k) and other defined contribution plans.

Social Security provides insurance against experiencing worse than expected labor market outcomes because low earners earn higher returns on their contributions. Modeling realistic parameters of labor market risk is beyond the study's scope; the risk varies by household. Therefore, our third yardstick does not incorporate labor market risk. We make the simplifying assumption that the age-50 decision is non-revocable. Assuming surviving spouses claim survivor benefits at the later of age 66 and their age when their spouse died understates the value of Social Security's longevity insurance because young surviving spouses with dependents may have extremely high marginal utilities of consumption and claim early.

We follow previous research (Brown and Poterba, 2000; Sun and Webb, 2011) and assume the couple's utility is a summation of the husband and wife's utility:

$$U_t\left(C_{s,t}^m, C_{s,t}^f\right) = U_t^m\left(C_{s,t}^m, C_{s,t}^f\right) + U_t^f\left(C_{s,t}^m, C_{s,t}^f\right) \quad (1)$$

where the husband and wife's utility functions take the following form:

$$U_t^m\left(C_{s,t}^m, C_{s,t}^f\right) = \frac{\left(C_{s,t}^m + \lambda C_{s,t}^f\right)^{1-\gamma}}{1-\gamma} \quad (2)$$

$$U_t^f\left(C_{s,t}^m, C_{s,t}^f\right) = \frac{\left(C_{s,t}^f + \lambda C_{s,t}^m\right)^{1-\gamma}}{1-\gamma} \quad (3)$$

$C_{s,t}^m$ and $C_{s,t}^f$ denote the consumption of the husband and wife respectively in survivorship status s (married and both alive, surviving male, or surviving female) at time t. λ measures the jointness of consumption. When λ equals one, all consumption is joint. When λ equals zero, none of the household's consumption is

joint. We assume that λ equals 0.5.[2] γ is the coefficient of risk aversion. We consider coefficients of risk aversion of two and five. These coefficients are at the lower end of the range reported in the literature, which tends to cluster between 2 and 10 depending in part on whether the estimates are derived from portfolio theory, purchases of insurance, economic experiments, or preferences over lotteries (Chetty, 2006). In our formulation, the coefficient of risk aversion is the inverse of the intertemporal elasticity of substitution. While acknowledging that the state contingent real annuity provided by Social Security may not be optimal (Yagi and Nishigaki, 1993) we treat reforms of the benefit structure as outside the scope of our study. Our assumption of additive utility is standard in the literature (for example, Mitchell et al., 1999), and the household's objective is to maximize their expected discounted lifetime utility:

$$\sum_{t=22}^{T}\sum_{s=1}^{3}\beta^{t-22}\rho_{s,t}U_t\left(C_{s,t}^{m},C_{s,t}^{f}\right) \tag{4}$$

where $\rho_{s,t}$ is the probability of the married couple being in marital status s at time t, and β is the time discount factor assumed to be 0.97 as is conventional in the annuity literature. Households may discount the future more steeply and a value of 0.97 can be interpreted either as a normative statement or as an estimate of the discount rate applicable to hyperbolic discounters assisted by a commitment mechanism (Laibson 1997).[3] The terminal age T is set at 105.

We consider five types of married couples, and use mortality tables based on sex, which is why we use gendered terms for spouses: a high earner husband whose wife has high, medium, or low earnings, and a medium earner husband whose wife is

[2] We obtain almost identical results, available on request, when we assume λ equals zero or one. A λ of 0.5 is broadly consistent with commonly used equivalence scales.

[3] In results that are not reported, we estimated our model assuming a time discount factor of 0.9. We found these households had considerably lower equivalent contribution rate, typically less than the contribution rate.

a medium or low earner. We do not report results for households in which the wife never worked outside the home. Although a significant share of women in this birth cohort earns little relative to their husbands that they qualify for spousal benefit, only a small minority never worked for pay.[4] We note that results are not symmetric for higher earning men married to lower earning women, due to differences in life expectancy. We compare these couples with high, medium, and low earning single men, and medium and low earning single women.[5]

Each period, the household decides how much un-annuitized wealth to consume and at age 50, the household faces a one-time option to participate in the Catch-Up program. The optimal choices depend on financial wealth and whether both or only one of the spouses is alive. The problem is solved using dynamic programming.[6]

The household's budget constraint can be written as follows:

$$A_{t+1} = (1+r)\left(A_t + I^m_{s,t} + I^f_{s,t} + SS^m_{s,t|d} + SS^f_{s,t|d} - C^m_{s,t} - C^f_{s,t}\right) \quad (5)$$

where $A_t \geq 0$ for all t is the household's unannuitized financial wealth at time t, and r is the risk-free rate. $I^m_{s,t}$ and $I^f_{s,t}$, respectively, are the husband and wife's labor income net of Social Security contributions, in marital status s at time t. They receive no labor income after retirement. $SS^m_{s,t|d}$ and $SS^f_{s,t|d}$ are the husband and wife's

[4] An analysis of couples in which one spouse did not work for pay would have to consider whether that spouse would enter the labor market in the event of the death of their spouse prior to age 60. If the spouse was assumed not to re-enter the labor market, the household would save implausibly large shares of income at young ages to guard against the risk of almost zero income and a correspondingly high marginal utility of consumption.

[5] Results for maximum and very low earners and households in which the wife is the primary earner are available from the authors on request. The latter are similar to the results for households in which the husband is the primary earner.

[6] This involves calculating an optimal strategy in period T, assumed to be age 105, calculating the utility of that strategy, and working back to age 22, calculating the strategy in each preceding period under the assumption that the household adopts the optimal strategy from that period onwards. The optimal strategy for each period is calculated for all feasible wealth values and all feasible Social Security retired worker, spousal, and survivor benefits.

Social Security benefits payable at time t and in survivorship state s, conditional on the age d at which the husband dies. We did not attempt to model bequests as we consider it likely that any operable bequest motives will be satisfied from remaining unannuitized wealth.

In each case, we assume that both husband and wife were born in 1949, and retire in 2015, and that either the husband or both husband and wife made Catch-Up contributions since 1999, when they turned age 50. We chose to study this birth cohort to avoid making assumptions about trends in wages, inflation, mortality, mortality differentials, and age-earnings profiles.[7]

Earnings are based on age-earnings profiles for workers with very low, low, medium, and high earnings relative to other workers of their age and birth cohort. These age-earnings profiles are based on "final scaled factors" reported in Clingman and Burkhalter (2016). These final scaled factors report earnings, by age, for workers whose Average Indexed Monthly Earnings equal 25, 45, 100, and 160 percent of the Average Wage Index (AWI) in the year they retire, respectively.[8] Among men, 71.5 percent have AIMEs less than the scaled high earner and 42.1 percent have earnings less than the scaled medium earner, and among women, 92.8, 72.5, and 34.5 percent

[7] Results for the 1965 birth cohort, incorporating real wage growth and assuming no change in earnings inequality or the age earnings profile, are available from the authors as are results for couples with different ages. Results for the 1965 cohort show almost identical returns, with projected increases in longevity approximately offsetting the increase in the FRA. Results for couples with different ages are also similar.

[8] Clingman and Burkhalter (2016) proceed as follows. First, they calculate raw scaled worker factors, the average earnings of workers who have worked sufficient quarters to become eligible for Social Security retired worker benefit, by age, as a percentage of the Average Wage Index. The denominator includes workers who did not work in that particular year. For example, average earnings of workers age 22 equaled 25.8 percent of the Average Wage Index. Second, focusing on the 1960 birth cohort, they multiply these raw scaled worker factors by the Average Wage Index for the corresponding calendar year. Third, they index these earnings to arrive at Average Indexed Monthly Earnings of insured workers in this cohort. Fourth, they calculate ratios for very low, low, medium, and high earners such that their AIMEs equal 25, 45, 100, and 160 percent of the Average Wage Index in the year they retire. Finally, they multiply the raw scaled worker factors by the ratios to arrive at final scaled factors.

have AIMEs less than those of the scaled high, medium, and low earners. We multiply these final scaled factors by the AWI for the relevant calendar years for our birth cohorts and index by changes in the Consumer Price Index to arrive at inflation adjusted earnings histories.

We acknowledge that these age earnings profiles may differ from those experienced in real life, sometimes by choice, and sometimes due to unfavorable labor market outcomes (Au, Mitchell, and Phillips, 2004; Bosworth, Burtless, and Steurle, 2000; Government Accountability Office, 1997; Hungerford, 2006). Specifically, workers typically have several years with zero earnings, often due to unemployment, child-care, or study. These zero earnings years will increase the likelihood that a Catch-Up year is counted as one of the top 35 and thus increase the return to Catch-Up contributions. Conversely, if a worker steps down to part time work at older ages, earnings in those years may be less likely to be counted as one of the top 35, reducing the return to Catch-Up contributions.

We did not use a structural estimation in which preference parameters are recovered from the data and used to simulate policy interventions effects (Gustman and Steinmeier, 2005). We acknowledge the potential concern that our model, and models like ours, predict much higher levels of annuitization than observed and ignores the gap between stated preferences for lifetime income and annuity demand – the so-called "annuity puzzle" (Brown, 2007; Inkmann, Lopes, and Michaelides, 2011). Household attitudes towards Social Security and annuities are contradictory. The Social Security program enjoys widespread political support. Opinion surveys indicate a preference for tax increases over benefit cuts (Walker, Reno, and Bethell, 2014), and when posed a hypothetical question, a large share of households was unwilling to forego Social Security benefits even on better than actuarially fair terms

(Brown, Casey, and Mitchell, 2007; Brown et al., 2021). We interpret these findings as evidence of a status quo bias and hypothesize that an appropriately framed default might elicit high participation rates. Nonetheless, a significant minority, concentrated among those with lower levels of financial literacy, expressed a willingness to trade part of their benefits for a lump sum (Brown, Casey, and Mitchell, 2007). Although some studies (for example, Pashchenko, 2013; Lockwood, 2018) have recovered structural estimates of preference parameters or found preference parameters consistent with observed annuitization behavior, these studies invariably focus on single individuals. We do not consider these findings can be applied to married households because of differences between the treatments of annuitized and unannuitized wealth under Medicaid spousal protection rules and consider that the annuity puzzle is still a puzzle (Webb, 2020).

Since studies and observation indicate preferences over drawdown strategies are heavily influenced by framing and defaults, perhaps because people do not know how to go thinking about the drawdown problem, it is not surprising findings conflict. If household preferences are both malleable and influenced by status-quo bias, the greatest value of intertemporal optimization models may to help policymakers identify appropriate household choices and guide households towards (or even mandate) those choices rather than to predict behavior.

The fourth and final yardstick is a comparison of Catch-Up benefits with the benefits from 401(k) or IRA contributions used to purchase an inflation-indexed joint life annuity at age 66. The risk characteristics of Social Security differ from those of financial assets. Assuming that steps are taken to address Social Security's actuarial shortfall, the most significant risks to the program include adverse changes in mortality, fertility, and wage growth, all of which would likely also affect capital

market returns (Krueger and Ludwig, 2007). Modeling and incorporating the covariance between mortality, fertility, wage growth, and capital market returns is beyond the scope of this study. We assume the return on Catch-Up contributions is risk free and compares it with the return on a risk-free bond. To the long-term investor, and ignoring default and inflation risk, a long-dated bond held to maturity is a risk-free asset because it insures consumption (Campbell and Viceira, 2001). Although households can earn higher expected returns in stocks, we consider the risk-free assumption reasonable. Many households do not participate in the stock market, and few participants hold a 100 percent stock portfolio. Our model allows Catch-Up contributions to crowd-out savings in financial assets, and any crowd-out would likely be of the portions invested in cash and bonds. To the extent that Catch-Up contributions displace bonds in retirement accounts, the riskiness of those accounts will increase. But the overall riskiness of the household's portfolio, including the expected present value of Social Security benefits will change little, if at all.

Of necessity, our model is a simplification of the household's decision. We identify the following factors that may affect optimal behavior. First, Catch-Up contributions may force low earners to over-save. We find that even low lifetime earner participants are not credit constrained after age 50 but acknowledge that a model in which the marginal utility of consumption varied over the life-cycle might yield different results. Households that were credit constrained could, of course, opt out of the program. Second, in contrast to Social Security contributions, savings in tax-deferred accounts fulfill a dual role - as retirement savings and as self-insurance against unemployment. The loss of liquidity may make workers reluctant to divert savings from tax-deferred accounts to Catch-Up contributions. We choose not to model the risk of pre-retirement job loss as it varies greatly both between and within

industries and occupations. Third, in our base case, we assume Catch-Up contributions are deductible from earnings for income tax purposes. Under current law, employee Social Security contributions are not tax deductible, and either 50 or 85 percent of Social Security income is subject to income tax, depending on combined income, defined as the sum of Adjusted Gross Income, non-taxable interest, and one half of Social Security benefits.[9] This asymmetry disadvantages Catch-Up contributions relative to savings in tax deferred accounts (TDAs) such as IRAs and 401(k)s where contributions are deductible and benefits taxed. We assume that the tax code is amended to create a level playing field between Catch-Up contributions and TDAs[10]. We report an alternative in which the tax treatment of Catch-Up contributions and benefits follows current tax law. Fourth, in our model, and following the annuitization literature (Mitchell et al., 1999; Brown and Poterba, 2000; Dushi and Webb, 2004) the retirement age is not a choice variable.[11] Fifth, the model excludes health and long-term care cost risk. A potential concern is that households might prefer not to participate in a Catch-Up program in order to preserve financial assets in liquid form as self-insurance against such costs. Webb (2020) surveys the literature and argues that the risk of incurring out of pocket health and long-term care

[9] Employer Social Security contributions are tax deductible because the employer claims a business expense, but the employee is not taxed on an imputed benefit. Thus, the taxation of 50 percent of benefits is tax neutral. The taxation of 85 percent of benefits of higher income retirees tax-disadvantages Social Security for these workers.

[10] This level playing field might involve either allowing a tax deduction for Catch-Up (but not regular) contributions and taxing Catch-Up benefits in full, or not allowing a tax deduction for Catch-Up contributions are exempting Catch-Up benefits from tax. The former would require an additional box on form W-2, the report of taxable earnings made by employers to the Social Security Administration and the latter would require an additional box on form SSA-1099, the form the Social Security Administration sends retirees every year to assist in tax filing. According more favorable tax treatment to a worker earning (say) $80,000 and making Catch-Up contributions than to a non-participant earning $120,000 does not violate horizontal equity but would detract from the simplicity of the current tax treatment of Social Security. We note that tax rules phasing in taxation of Social Security benefits for retirees with higher incomes already introduce a complexity and that a level playing field might be created by modification of these rules.

[11] To do otherwise we would need to make assumptions regarding the disutility of work. A wealth effect might enable workers to retire somewhat earlier, increasing the value of Catch-Up contributions. But the dollar amounts of the additional benefits lead us to believe that the effect would be small.

costs actually increases the value of annuitization, at least for couples, and would presumably also increase the value of Catch-Up contributions.[12]

IV. RESULTS

A. Benefits Payable at Age 66

Table 1 reports the projected effect of Catch-Up contributions on benefits payable at age 66 and age 66 replacement rates. The upper panel shows results for singles and the lower panel shows results for married couples. Consider the results for singles. The medium earner enjoys a larger increase in benefits ($238) than the low earner ($111) reflecting their higher lifetime earnings. But the increase for the high earner ($184) is somewhat less than for the medium earner reflecting their location on the higher segment of the three-part PIA formula. Medium and lower earners both enjoy similar percentage point increases in their replacement rates because their Catch-Up contributions place them on the middle segment of the PIA formula. Higher earners experience a smaller percentage point increase.

Turning to couples, when both the primary and secondary earner have similar PIAs, the Catch-Up contributions of primary earners increase household benefits by the same amounts as the Catch-Up contributions of single individuals with the same PIA. But when the secondary earner earns so much less that they qualify for a spousal benefit, the primary earner's Catch-Up contributions increase household benefits increase by more, reflecting the impact of Catch-Up contributions on spousal benefits. In contrast, the secondary earner's Catch-Up contributions provide no additional benefit.

[12] Engelhardt and Eriksen (2020) argue that most households can satisfy their bequest motive from housing wealth. Thus, a bequest motive is unlikely to contribute to a reluctance to annuitize financial assets through a Catch-Up program.

The percentage point increases in household-level replacement rates are generally larger for medium than for high earners – up to 6.7 percentage points for the medium earner married to a low earner, increasing that household's Social Security replacement rate from 49.7 to 56.4 percent. Households will still need to rely on prefunded retirement wealth to attain target 70 percent plus replacement rates often deemed adequate to maintain pre-retirement consumption (Palmer, 2008).

B. Rate of Return on Catch-Up Contributions

For single individuals, we report real rates of return for high, medium, and low earner men and medium and low earner women (Table 2 upper panel). For couples (Table 2 lower panels), we report the real rates of return on 1) the primary earner's contributions, assuming the secondary earner does not contribute, 2) the secondary earner's contributions, given that the primary earner is already contributing, and 3) the sum of the primary and secondary earners' contributions. We implicitly assume that the primary earner decides whether to participate, and that the secondary earner only considers whether to participate if the primary earner has already decided to participate.[13] The combined return permits a comparison between current law and a mandate applying to both primary and secondary earners.

We report calculations assuming population average mortality using Social Security Administration life tables for the 1949 birth cohort. We then allow mortality to vary with race/ethnicity and educational attainment. We do not consider a possible "broken heart" relationship between the mortality of married couples (Frees, Carriere, and Valdez, 1996). In each case, we assume the primary earner is male and the

[13] In most situations it is better for only the primary earner than only the secondary earner to contribute. The lower earner will switch to survivor benefit on the death of the higher earner, so that any Catch-Up benefits are payable only when both are alive, reducing the return to the secondary earner's Catch-Up contributions. But the lower earner may earn a higher monthly return on contributions if they are on the 32 percent and the primary earner on the 15 percent segment of the benefit formula.

secondary earner is female and that both earners are the same age. We consider earnings combinations of high-high, high-medium, high-low, medium-medium, and medium-low for the primary and secondary earner. Unreported results where the primary earner is female are similar, notwithstanding differences in assumed mortality.

The key findings are 1) the real internal rate of return (IRR) on Catch-Up contributions is almost always positive for single men and higher for single women than for single men with the same income, reflecting women's greater longevity, 2) the IRR is substantially higher for primary earners than single individuals of the same gender, and 3) the IRR can be negative for secondary earners who are either eligible for spousal benefits or who are on the 15 percent segment of the PIA formula.

To illustrate, high earning single men with population average mortality earn a real rate of return of 0.1 percent a year, compared with 4.2 percent for medium and low earners, reflecting the high earners' location on the 15 percent segment of the PIA formula. But the IRR for primary earners, regardless of earnings, exceeds the one percent currently obtainable on Treasury Inflation Protected Securities.[14] High earning men married to high earning women earn 1.9 percent, reflecting the impact of the husband's Catch-Up contributions on the wife's survivor benefit, and high earning men married to low earning women earn 3.1 percent, reflecting the impact of the husband's Catch-Up contributions on both the wife's survivor and spousal benefits.

When the woman is the secondary earner, her rate of return is less than that of a single woman with the same lifetime earnings. Medium earner and low earner women married to high earner men earn 2.5 percent and minus 10.5 percent a year

[14] On 19 November 2018, the yield on 10-year TIPS was 1.06 percent. https://fred.stlouisfed.org/series/DFII10

compared with 5.0 and 5.1 percent for their single counterparts, reflecting the displacement of her retired worker benefit by survivor benefit in the former case and both survivor and spousal benefit in the latter case.

Socioeconomic status explains mortality differences more than do gender differences in mortality (Sanzenbacher et al, 2015). Using the relative mortality factors for socioeconomic groups estimated by Brown, Liebman, and Pollet (2002), we test the sensitivity of our rate of return calculations to alternative mortality assumptions. The exercise is for illustrative purposes only; we acknowledge that mortality is correlated with income even after conditioning on education and race, and that some combinations of income and mortality, for example a high earner with less than a high school education will occur only infrequently.

The Brown, Liebman, and Pollet (2002) calculations are based on National Longitudinal Mortality Study data from 1975-1989 and are the most recent estimates of relative annual mortality rates by age. They are representative of individuals alive in the above period, not of a particular birth cohort. A potential concern is that socioeconomic mortality differences may have widened in recent years (Sasson, 2016), with part of the increase reflecting the changing composition of high-school dropouts (Sanzenbacher et al., 2018). Our analysis of the Brown, Liebman, and Pollet (2002) data shows a life expectancy gap of just over 13 years between Black men with less than a high school education and White men with some college-level education, conditional on surviving to age 25. In contrast, Sasson (2016) reported a 2010 gap of just under 12 years between Black high school dropouts and Whites who completed college and Sanzenbacher et al. (2015) a 7.3 year gap between men in the top and bottom quartiles of educational attainment. We therefore regard our estimates

as likely representing an upper bound to the effect of socioeconomic mortality differentials on rates of return.

The key finding is that with rare exceptions, single men and women, and men (and women) who are the primary earner, still enjoy positive real rates of return even after adjusting for socioeconomic mortality differentials, although the negative relationship between lifetime income and rate of return is somewhat weakened. For example, the return enjoyed by a high earner man married to a medium earner woman increases from 2.0 to 2.2 percent when they are both given the mortality of college educated Whites, and the return enjoyed by a medium earner man married to a low earner woman decreases from 5.9 to 4.9 percent when they are both given the mortality of Blacks with less than a high school education.

C. Equivalent Contribution Rate

We calculated what we term the "equivalent contribution rate" (ECR), the contribution rate at which households are indifferent between participating and not participating (Table 3), assuming population average mortality. When the ECR exceeds 3.1 percent, the household is better off participating. We report results for single men and women, married couples in which only the primary earner (which we assume to be the husband) participates, the marginal value of the contributions of the secondary earner (which we assume to be the wife), and the ECR when both contribute. The last metric is particularly relevant when comparing a Catch-Up mandate with an opt-out design. We do not report results by race/ethnicity and educational attainment as ECR is little affected by relative mortality risk, consistent with Brown (2002) calculations of annuity equivalent wealth.

The key finding is that ECR is higher for primary earners than for single individuals and always exceeds 3.1 percent of pay, often by substantial margins,

irrespective of the assumed coefficient of risk aversion or assumed rate of return on financial assets. In contrast, whether the program is beneficial to the secondary earner is sensitive to the primary earner's and the secondary earner's earnings, the assumed coefficient of risk aversion, and the assumed rate of return on financial assets. The ECR of the secondary earner is sometimes, but not always above the 3.1 percent threshold at which participation is optimal. Viewed at the household level, the ECR almost always exceeds 3.1 percent, sometimes by substantial margins. The opportunity to purchase additional longevity insurance is sufficient to compensate for rates of return that sometimes fall short of those obtainable on financial assets.

To illustrate, assuming a coefficient of risk aversion of five and a rate of return on financial assets of three percent, the ECRs for high, medium, and low earner single men are 3.8, 7.4, and 6.5 percent, respectively. The lower ECR for the high earner reflects their location on the 15 percent segment of the PIA formula. Although the medium and low earners earn similar rates of return, the medium earner has a higher ECR, reflecting their smaller share of pre-annuitized wealth and our assumption of a CRRA utility function. But high earners married to high, medium, or low earners have ECRs of 4.1, 4.1, and 4.9 percent, compared with 3.8 percent for the equivalent single man. Medium earners married to medium or low earners have ECRs of 8.3 and 8.0 percent, compared with 7.4 percent for the equivalent single man.

Alternative assumptions regarding the coefficient of risk aversion and rate of return on financial assets have predictable effects. A reduction in the coefficient of risk aversion from five to two reduces the ECR of married men by 0.6 to 1.3 percent (assuming a 3 percent rate of return). A reduction in the real interest rate on financial assets from 3 to one percent increases the ECR by 2.3 to 4.5 percent (assuming a coefficient of risk aversion of five).

The model yields wealth at age 50 that is considerably in excess of that observed in survey data. One explanation might be that households have a preference for higher consumption at younger ages when children are at home and plan to do most of their saving after age 50 (Scholz, Seshadri, and Khitatrakun, 2006). Alternative explanations are that some households discount future consumption hyperbolically (Laibson, 1997) or have high discount rates. Hyperbolic discounters may value the Catch-Up contribution commitment mechanism. But a potential concern is that households with high discount rates may shun the program. We calculated the minimum rate of time preference consistent with accumulating zero wealth at age 50, assuming households otherwise have no preference for greater consumption at younger ages. We then calculated the ECR, given that rate of time preference. We found that high discount rates reduced the ECR, but not generally below the level that would make participation beneficial. High discount rate households save little and do most of their saving at older ages but would still prefer to save through Catch-Up contributions. Consider a medium earner male with a coefficient of risk aversion of five. Delaying saving until age 50 requires a discount rate of 15 percent. But that discount rate yields an ECR of 4.5 percent, compared with 7.4 percent for the 3 percent discount rate male, and still above the 3.1 percent contribution rate.

Participation is optimal for risk-averse secondary earners, regardless of absolute or relative earnings, the one exception is high earners under an assumption of a three percent real return on financial assets. Whether it is optimal for risk-tolerant secondary earners is more sensitive to assumptions regarding absolute and relative earnings and the rate of return on financial assets. For example, a low earner married

to a high earner has an ECR of only 0.8 percent when the coefficient of risk aversion is two and the rate of return three percent.

When viewed at the household level, participation is almost always optimal, the one exception being risk tolerant couples with two high earning spouses, where the ECR is 2.7 percent. Thus, if the alternative to the status quo is a mandate, almost all households would benefit, sometimes by substantial amounts.

D. Comparing Catch-Up Contributions with Commercial Annuities

The above analysis compares the Catch-Up program with the optimal accumulation and drawdown of financial assets. An optimal accumulation is a theoretical construct that few households are capable of calculating; most households use heuristics (Sun and Webb, 2013) and would therefore find the Catch-Up program even more valuable. However, the analysis excludes the option of accumulating financial assets from age 50 to 66 and then purchasing an inflation-indexed annuity from an insurance company, which is now not possible.[15] We now consider this latter option. We identify two factors that make the individual annuity approach expensive and economically inefficient. First, the individual annuity market suffers from adverse selection that contributes to prices being considerably less than actuarially fair to purchasers with population average morality (Mitchell et al., 1999). Second, workers who purchase an annuity at retirement also forego pre-retirement mortality credits – in the event of death before retirement, their accumulated wealth passes as a possibly unintended bequest rather than being used to increase the benefits of those who survive. But the accumulation of financial assets may still provide higher post-

[15] As of January 2021, the last insurer has withdrawn from the inflation-indexed annuity market. Although households can purchase escalating annuities, they do not offer equivalent protection. (Webb, 2021).

retirement income if the rate of return on financial assets is sufficiently higher than that on Catch-Up contributions.

We assume workers earn a 3 percent real return on their financial wealth, the standard assumption in the literature, and an alternative in which participants earn a one percent return, in line with current returns on Treasury Inflation Protected Securities. Of course, workers could earn higher expected returns in the stock market, but as with Catch-Up contributions, inflation indexed annuities substitute for bonds in the household's portfolio.

We assume current annuity rates and an alternative in which insurers price annuities using a 3 percent real interest rate, holding current sales loads constant. Specifically, we use current market annuity rates, back out a level of actuarial unfairness assuming projected annuitant mortality (we use the Individual Annuity 2012 mortality table and Projection Scale G), and re-price the annuity assuming that level of actuarial unfairness and a 3 percent real interest rate.

We report results for primary earners married to lower earning secondary earners where the earnings of the secondary earner are not so low as to create an entitlement to spousal benefits (Table 4). We again assume population average mortality. For these households, Catch-Up contributions increase the primary earner's retired worker benefit and the secondary earner's survivor benefit, so the analogous commercial product is a joint-life and 100 percent survivor inflation indexed annuity. We do not report results for secondary earners or primary earners married to secondary earners with very low relative earnings because the individual annuity market does not offer competing products. For example, it is not possible to purchase an inflation-indexed annuity with benefits that cease on the first death of two named individuals.

Commercial annuities are relatively more attractive to higher earners, reflecting the progressivity of the Social Security benefit formula, and at higher assumed rates of return. But in all four cases studied, Catch-Up contributions provide larger benefits than commercial annuities, often by substantial margins. Consider a medium earner earning a one percent return. The medium earner would have accumulated $20,400 at age 66, which would buy an annuity of $66 a month, only 28 percent of their Catch-Up benefits. At a three percent return, a high earner would have accumulated $33,400, which would buy an annuity of $168 a month, still short of the $184 a month provided by Catch-Up contributions.

E. The Optimal Contribution Rate

A higher contribution rate would yield proportionately larger benefits. Within our model, the optimal contribution rate is one where the marginal benefit of additional contributions equals marginal cost. We acknowledge a limitation of our model, namely that it only includes a single risk-free asset. Even risk-averse workers will likely benefit from some exposure to the equity premium. In a model with both a risky and a risk-free financial asset, Catch-Up contributions will first crowd out the risk-free financial asset. The worker will then trade off, at the margin, the benefit of exposure to the risky asset versus the loss of the longevity insurance that would be acquired through Catch-Up contributions. The optimal Catch-Up contribution rate would likely be less than the rate in a model where there is only a risk-free asset.

We also emphasize that Social Security is not risk-free. Specifically, the program faces an actuarial shortfall and barring legislative intervention will be unable to pay current law benefits once the Trust Fund is exhausted. Given the intermediate assumptions used by the Social Security actuaries, Catch-Up contributions leave the 75-year actuarial balance almost unchanged. Workers might be deterred from

participation if they believed, perhaps correctly, Catch-Up contributions might be cut as part of a reform package designed to restore actuarial balance. Successful introduction might require that measures be taken to bridge the actuarial shortfall.

Table 5 upper panel reports the optimal Catch-Up contribution rate for single men and women, exclusive of the current mandatory contribution rate. In each case, we assume a coefficient of risk aversion of five and a real rate of return of three percent on a risk-free financial asset. Regardless of earnings, single men and women prefer a higher than 3.1 percent Catch-Up contribution rate.[16] A high contribution rate is beneficial even for men and women who earn a lower rate of return on Catch-Up contributions than the assumed rate of return on financial assets, reflecting the value they place on the opportunity to make additional annuity purchases thereby reallocating consumption from low or zero to high marginal utility states of the world. Consumption is liquidity constrained at young ages, declines at older ages at a rate approximating to the mortality rate multiplied by the intertemporal elasticity of consumption, until it flattens once financial assets are exhausted. At all ages prior to age 65, during the accumulation phase, consumption is almost identical regardless of the Catch-Up contribution rate so that Catch-Up contributions crowd out savings in financial assets almost exactly dollar-for-dollar (See Figure 1 (consumption) and Figure 2 (financial assets) for the medium male earner). Most of the increase in consumption occurs at very advanced ages because after financial assets are exhausted Catch-Up participants continue to enjoy a higher level of annuitized

[16] A surprising feature of our results is that the optimal contribution rate is substantially higher than 3.1 percent even when willingness to pay for a 3.1 percent contribution rate is only modestly higher than 3.1 percent. Thus, a high earner single male would optimally contribute 21.8 percent of salary but values a 3.1 percent contribution rate at only slightly more than 3.1 percent of salary – 3.8 percent. We verified our results by calculating consumption and expected utility at selected contribution rates and confirming that expected lifetime utility was maximized at 21.8 percent of salary. We also note that full annuitization is rarely optimal, reflecting the lower return on Catch-Up contributions than on financial assets and the decreasing marginal value of annuitization under CRRA utility.

income. Even though high earners earn a lower rate of return on Catch-Up contributions than on financial assets, they prefer to invest substantial proportions of their wealth in Social Security to benefit from annuitization. Under the assumption of constant relative risk aversion, they place lower values on succeeding annuity tranches and annuitize their wealth up to the point where the marginal value of annuitization is just sufficient to compensate for the lower return they earn on Catch-Up contributions. We acknowledge a limitation of our analysis, namely that our model predicts substantial accumulation of financial assets by age 50 whereas in reality a large minority of households fail to accumulate significant financial wealth and, faced with labor market risk, might be reluctant to invest in illiquid Catch-Up contributions.[17]

Table 5 lower panel reports the optimal contribution rate for the primary earner in a married couple (assumed to be the husband), and the optimal contribution rate for married couples in which both spouses contribute the same percentage of salary, using the same assumptions. The optimal contribution rate for the primary earner is dramatically higher than 3.1 percent, reflecting not only the value of annuitization, but also the impact of the higher contribution rate on spousal and survivor benefits. The high earner married to a high earner chooses a higher contribution rate than a high earner married to a low earner, reflecting the former household's greater post-retirement needs and wealth accumulated by age 50 and thus available to fund Catch-Up contributions.

The secondary earner's additional benefits are payable over the shorter period ending on the earlier of their and their spouse's death, reducing the value they place

[17] We estimated our model on households we assumed had zero financial wealth at age 50 but had the same 0.97 time discount factor, again assuming zero labor market risk, and obtained similar results.

on their Catch-Up contributions. As a result, the optimal contribution rate for married couples is substantially less than that for the primary earner, although still in excess of 3.1 percent at our assumed coefficient of risk aversion and rate of return on financial assets.[18]

F. Taxation

Table 6 reports after tax rates of return and Table 7 reports the effect of taxation on the equivalent contribution rate.[19] In each case, we assume a coefficient of risk aversion of five and a real rate of return of three percent on a risk-free financial asset. To facilitate comparison, the table also reports base case results in parentheses. The current disadvantageous tax treatment relative to 401(k) contributions reduces the equivalent contribution rate by around half a percentage point but does not change the basic results that under most scenarios households are better off participating. But in results that are not reported, we find that the disadvantageous tax treatment can, under optimistic assumptions regarding interest rates, tilt the balance of advantage for high earners in favor of commercial annuities.

V. DISCUSSION

A. Comparing Catch-Up to Allowing Social Security to Sell Annuities

Comparisons of calculations of actuarial unfairness using annuitant and population mortality tables indicates that the actuarial unfairness of annuities to people with population mortality mostly reflects the lower mortality of people who

[18] In results that are not reported, we calculated optimal contribution rates assuming a coefficient of risk aversion of two and an assumed real rate of return on financial assets of one percent. With rare exceptions, optimal contribution rates exceeded zero.

[19] One approach is to calculate the rate of return on Catch-Up assuming zero displacement of 401(k) contributions. Under this assumption, the after-tax rate of return is less than the pre-tax. Another is to calculate the rate of return assuming 100 percent displacement, taking into account the increase in taxes during the household's working life and the larger reduction during retirement due to the preferential tax treatment of Social Security benefits. Neither is wholly satisfactory, and we calculated taxes assuming the actual level of displacement. Under this assumption, the post-tax rate of return is less than the pre-tax, but counter-intuitively, the reduction in rate of return is greater for higher earners.

actually buy them rather the effects of profits, fees, and sales commissions (Mitchell et al., 1999; James and Song, 2001).

Other proposals to purchase more Social Security benefits include Munnell (2013) and Thaler (2019). Munnell proposed individuals be allowed to purchase an annuity up to $250,000 from Social Security. We believe Munnell's and Thaler's proposed products would attract a similar demographic to those who currently buy annuities from insurance companies and would suffer from similar levels of adverse selection. Unless prices were set close to those charged by commercial insurers, thereby offering little additional benefit, the product would drain the Social Security Trust Fund, for the benefit those already better prepared for retirement. The proposal would not benefit those most in need of additional income, who arrive at retirement with only Social Security. In contrast to the proposed Catch-Up program, which uses the progressivity of the Social Security benefit formula to target low lifetime earners, both rich and poor would face the same annuity rates under the Munnell and Thaler proposals. A second channel may also reduce adverse selection. At age 65, annuity purchasers know a lot about their relative mortality risk. People age 50 may know far less about their relative post retirement mortality risk and have less information on which to select in or out of annuity purchase.

B. Why a Mandate May Be Beneficial

A mandate offers two advantages. First, it extends coverage to those who would be better off participating but would, in the absence of a mandate, choose to opt out. A mandate might therefore be justified on social policy grounds and within social insurance principles. Second, it may eliminate adverse selection and enable all participants to benefit from more favorable terms. But a mandate entails two costs. First, political costs, and second, harms to those who would rationally choose not to

participate even on the more favorable terms made possible by a mandate. Policymakers must evaluate and trade-off these costs and benefits.

Considering first the benefits of a mandate, although some believe defaults achieve acceptable levels of participation in 401(k) plans (Belbase and Sanzenbacher, 2017; Choi et al., 2001; Clark, Utkus, and Young, 2015; Madrian and Shea, 2001), a default is unlikely to achieve universal coverage among those who would most benefit, reflecting time inconsistent behavior (Laibson, 1997) among other factors. Those least likely to participate may suffer the greatest loss of utility.

A mandate would protect the Catch-Up program from adverse selection. We identify five potential sources of adverse selection. First, adverse selection occurs because high earners live longer than low earners and will receive Catch-Up benefits for more years. But participation by high earners aids the program because high earners cross-subsidize low earners because of the program's progressivity. Second, high earners may opt-out, leaving only low earners earning higher returns and this form of selection might be exacerbated if workers had an annual right to opt in or out. But our calculations show that the program is attractive to high earners. Third, adverse selection may occur on the basis of lifetime earnings, with workers whose Catch-Up years will not be among the highest 35 wage-indexed years opting out. This form of adverse selection appears unlikely. The Clingman and Burkhalter (2016) analysis shows that for stylized workers earnings past age 50 count as part of the top 35 years for all except low lifetime earners and then only at advanced ages. Using stylized earners overstate the potential problem: the model does not include years with zero earnings and earnings declines partially reflect older workers exiting the labor force who would no longer be able to participate. Fourth, if workers had an annual right to participate, they might select in or out of the program as they learned more

about their relative mortality risk. The fifth and, to our mind most significant risk, is low-earning spouses opting out of the Catch-Up program because they earn low or negative returns. But, as we said before, this is a shrinking group.

A mandated social insurance program always raises the possibility of two costs: the political cost of a mandate being perceived as a tax increase rather than as a payment for future benefits and that low earners would be better off with current contributions and benefits. Pang and Schieber (2014) argue that with the mortgage paid off and child rearing expenses ending, low earners do not need more than current Social Security benefits to maintain their pre-retirement standard of living and that mandated savings would force low earners to "over-save" (shifting consumption from younger ages when the marginal utility of consumption is high to older ages when, the authors claim it is lower). We acknowledge the theoretical possibility; it requires extreme assumptions regarding household preferences for the risk to be significant and a heroic view of low earners living on 80-90 percent of their already low earnings in retirement (Munnell, Rutledge, and Webb, 2014).[20]

C. Impact on Poverty

Thus far, our study of the Catch-Up proposal is a retrospective analysis of how workers currently entering retirement would have fared. Due to the limits of computational feasibility, our model does not capture the rich variety of demographic and economic events households experience over their lifetimes. A benefit of winning the AARP innovation grant is the Urban Institute simulating the program's impact on succeeding birth cohorts using the DYNASIM microsimulation model (Faverault, Smith, and Johnson, 2015). Researchers use the DYNASIM model to simulate the

[20] Specifically, it requires some combination of low earnings, high equivalence scales for children, a large mortgage, a high intertemporal elasticity of substitution, high mortality, and low post-retirement health care cost.

distributional effects of policy interventions. The DYNASIM analysis projected that Catch-Up contributions would reduce poverty by 1.8 percentage points by 2060, with the greatest reductions among the working poor. We refer the reader to Ghilarducci et al. (2018) for further details.

D. Impact on The Trust Fund

Shoring up Social Security's finances is a precondition for this Catch-Up proposal to work otherwise participants may be deterred by uncertainty as to the return they will obtain on their contributions (Brown, Casey, and Mitchell, 2007). The question arises – over what time horizon should the impact on the Trust Fund be evaluated? Prior to 1965, the Social Security Trustees used an infinite horizon (Congressional Research Service, 2021). In 1965, the Social Security Advisory Council recommended a 75-year projection period because "it is as long a period as can be expected to have a realistic basis for estimating purposes." We share their view and therefore give prominence to short range (25-year) and long-range (75 year) horizons. An important consequence of cutting off the calculations at 75 years is that the calculations will include contributions but not the benefits earned by those contributions, increasing the infinite horizon actuarial shortfall. The policy concern is that 75 years finite horizon calculations may bias policymakers in favor of expanding benefits, storing up problems for the future (Schieber and Shoven, 1999).

Assuming universal participation, over a 25-year horizon, the reform would narrow the actuarial shortfall from 1.45 percent to 0.93 percent of payroll, reflecting additional payroll tax receipts that would not be matched by additional benefit payments (Table 9). Over a 75-year horizon, the reform would be almost exactly actuarially neutral, increasing the shortfall from 2.82 to 2.83 percent of payroll. We refer the reader to Ghilarducci et al. (2018) for further details.

Thus, the program would not contribute to bridging the actuarial shortfall, but this was not its objective, and other policy instruments are available for that purpose. However, the DYNASIM simulations indicate that the program would postpone exhaustion of the Trust Fund from 2034 to 2037, reflecting increased payroll tax receipts. We note that these calculations were made prior to the 0.4 percent reduction in the assumed real interest rate on the Trust Fund between the 2018 and 2020 Trustees Reports and that calculations based on current assumptions might be less favorable, as might assumptions incorporating the effects of covid-19 on contributions and real interest rates.[21] We also note that the proposal would reduce the actuarial shortfall over a 25-year horizon, implying an increased deficit in later years, so that the program would get farther from sustainable solvency. We also acknowledge it may be more politically contentious to enact reforms to restore solvency in an expanded program.

To address the concerns of those who prefer infinite horizon calculations, we report the impact of Catch-Up on the expected present value of lifetime taxes and benefits for ten-year birth cohorts 1950-2009. These calculations do not cut-off tax payments and benefit receipts at 75 years. All amounts are discounted back to age 50 at a three percent real interest rate (Table 8). At a lower interest rate, the present values of both contributions and benefits would increase. But the infinite horizon actuarial shortfall for each cohort would increase because benefits are discounted for more years than contributions. We chose three percent because it is close to the real rate of return on the Social Security Trust Fund assumed in Social Security Trustees

[21] Income tax on Social Security benefits is credited to the Trust Fund. If Catch-Up contributions were taxed in the same way as traditional IRAs, with contributions being tax deductible and benefits taxable, the Trust Fund would benefit from additional tax receipts unless steps were taken to preserve symmetry by charging the Trust Fund with the cost of the tax deduction.

Reports (in recent years the assumed rate of return has trended down to 2.3 percent). We acknowledge that prospective returns on long maturity Treasury bonds currently fall far short of three percent.[22] The longest maturity Treasury bond is 30 years. Projecting yields beyond 30 years is highly speculative and we therefore rely on the assumptions made in Trustees Reports which until recently were close to three percent.

Consistent with Catch-Up having a negligible effect on the 75-year liability, we find that the expected present value of lifetime benefits exceeds the expected present value of lifetime taxes for each of our cohorts. To illustrate, for the cohort born 1960-69, Catch-Up increases benefits by 7 percent and taxes by 5.6 percent with Catch-Up benefits exceeding taxes by $32 billion. We would characterize these amounts as small but not insignificant.

VI. CONCLUSION

The United States faces a severe and imminent retirement savings crisis. Almost half of older middle-class workers will be de-facto poor at age 65 (Ghilarducci, Papadopoulos, and Webb, 2018) and the U.S. has among the highest elder poverty rates in the OECD (2016). The policy debate has focused on working longer, saving more, and cutting Social Security benefits to restore long-run solvency. Working longer is neither a feasible nor an equitable solution for those most at risk of downward mobility in retirement. Saving more would ease the crisis. But those most at risk often lack access to workplace retirement savings plans, and the 401(k) system, characterized by high fees, leakages, and difficulty of converting accumulated wealth into lifetime income, is ill-designed to help them.

[22] An alternative approach would be to assume the rate of return provided by a pure pay-as-you-go system, which equals the growth in aggregate earnings subject to the Social Security tax, and which even under the low-cost forecast in the Trustees Report falls short of three percent.

This study evaluates a proposal for a Social Security Catch-Up program – a winner of the AARP 2016 "Innovation Challenge" contest. We conclude that for plausible beliefs and preference parameters, risk-averse households facing an uncertain lifespan will value the program at greater than the required contribution rate, and will also prefer it to purchasing a commercial annuity. The program will not solve the retirement savings crisis. But it will narrow the gap between needs and resources.

An obvious concern is that those who would derive the most benefit might opt out of the program. Although well-crafted defaults have been shown to achieve high participation rates in 401(k) plans, we do not know whether they would be similarly effective with Catch-Up contributions. If defaults fail to work, participation could be mandated. We see little evidence that workers would be harmed by a mandate, and a mandate would be within the social insurance tradition.

This study contributes to the political debate about how to close the Social Security actuarial shortfall. This debate is framed in terms of payroll tax increases versus benefit cuts, with a presumption that higher earners prefer benefit cuts, by reason of their lower return on contributions, and lower earners favoring tax increases. However, we show that, at the margin, workers in all income groups, benefit from paying higher FICA taxes in return for more Social Security benefits.

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TABLE OF ACRONYMS

AIME Average Indexed Monthly Earnings

ECR Equivalent contribution rate

FRA Full Retirement Age

IRA Individual Retirement Account

IRR Internal rate of return

OECD Organization of Economic Cooperation and Development

PIA Primary Insurance Amount

TDA Tax deferred account

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FIGURES AND TABLES

Table 1
PROJECTED IMPACT OF CATCH-UP CONTRIBUTIONS ON BENEFITS

Singles			
Earnings	High	Medium	Low
Existing monthly benefits ($)	2,127	1,600	974
Existing replacement rate (%)	37.1	44.8	60.4
Additional benefits ($)	184	238	111
Benefits with Catch-Up contributions ($)	2,311	1,839	1,084
Increase in replacement rate (%)	3.2	6.7	6.8
Replacement rate after Catch-Up (%)	40.3	51.5	67.2

Couples					
Earnings of primary earner	High	High	High	Medium	Medium
Earnings of secondary earner	High	Medium	Low	Medium	Low
Existing monthly benefits of couple ($)	4,254	3,727	3,191	3,200	2,574
Existing replacement rate (%)	37.1	40.1	43.4	44.8	49.7
Additional benefits from:					
Catch-Up contributions of primary earner ($)	184	184	276	238	238
Catch-Up benefits of secondary earner ($)	184	238	0	238	111
Total ($)	368	423	276	477	349
Benefits with self and spouse Catch-Up ($)	4,623	4,150	3,467	3,677	2,923
Addition to replacement rate from:					
Catch-Up contributions of primary earner (%)	1.6	2.0	3.8	3.3	4.6
Catch-Up benefits of secondary earner (%)	1.6	2.5	0.0	3.3	2.1
Total (%)	3.2	4.5	3.8	6.7	6.7
Replacement rate with self and spouse Catch-Up (%)	40.3	44.6	47.2	51.5	56.4

Source: Authors' calculations.
Note: 1949 birth cohort. Population average mortality. Scaled high, medium, and low earners. The claim age is 66 and the dollar amounts are in 2015 Dollars. Rates of return are in real (inflation adjusted) terms.

Table 2

PROJECTED RATE OF RETURN (%) ON CATCH-UP CONTRIBUTIONS, SINGLES AND MARRIED COUPLES

	Single men			Single women	
Lifetime earnings	High	Medium	Low	Medium	Low
All (%)	0.1	4.2	4.2	5.0	5.1
White less than high school	-0.4	3.6	3.7	4.7	4.8
White high school	0.1	4.2	4.2	5.1	5.1
White some college	0.6	4.7	4.7	5.3	5.4
Black less than high school	-1.3	2.7	2.7	4.0	4.1
Black high school and college	-0.7	3.3	3.4	4.6	4.6
Hispanic	0.7	4.8	4.8	5.3	5.4
	Only husband makes Catch-Up contributions				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
All (%)	1.9	2.0	3.1	5.8	5.9
White less than high school	1.6	1.7	2.7	5.5	5.6
White high school	1.9	2.0	3.1	5.8	5.9
White some college	2.2	2.2	3.5	6.1	6.1
Black less than high school	1.0	1.0	1.8	4.8	4.9
Black high school and college	1.5	1.6	2.5	5.4	5.5
Hispanic	2.2	2.2	3.5	6.1	6.1
	Marginal return on wife's Catch-Up contributions				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
All (%)	-1.3	2.5	-10.5	3.0	2.3
White less than high school	-1.9	1.7	-10.5	2.4	1.4
White high school	-1.3	2.5	-11.0	3.0	2.4
White some college	-0.7	3.3	-11.6	3.6	3.3
Black less than high school	-2.3	0.7	-6.7	1.8	0.0
Black high school and college	-1.9	1.3	-8.8	2.3	0.9
Hispanic	-0.3	3.5	-7.3	3.9	3.3
	Husband and wife make Catch-Up contributions				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
All (%)	0.6	2.1	1.8	4.6	5.0
White less than high school	0.2	1.7	1.4	4.2	4.6
White high school	0.6	2.2	1.8	4.6	5.0
White some college	1.0	2.6	2.2	5.0	5.4
Black less than high school	-0.5	0.9	0.6	3.4	3.7
Black high school and college	0.1	1.5	1.2	4.0	4.4
Hispanic	1.1	2.7	2.2	5.1	5.4

Source: Authors' calculations.

Notes: 1949 birth cohort. Mortality varies by race and educational attainment. Scaled high, medium and low earners. Rates of return are in real (inflation adjusted) terms.

Table 3

PROJECTED EQUIVALENT CONTRIBUTION RATE (%) BY LIFETIME EARNINGS

	Single men			Single women	
	High	Medium	Low	Medium	Low
			Rate of return = 3%		
CRRA = 2 (%)	3.1	6.1	5.6	6.7	6.2
CRRA = 5	3.8	7.4	6.5	7.9	7.0
			Rate of return = 1%		
CRRA = 2	4.1	7.8	6.6	8.7	7.5
CRRA = 5	5.5	10.2	8.5	11.2	9.5
			Only husband makes Catch-Up contributions		
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
			Rate of return = 3%		
CRRA = 2 (%)	3.5	3.4	4.1	7.1	6.7
CRRA = 5	4.1	4.1	4.9	8.3	8.0
			Rate of return = 1%		
CRRA = 2	5.0	4.8	5.6	9.9	9.0
CRRA = 5	6.5	6.4	7.2	12.8	11.7
			Marginal benefit of wife's contributions		
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
			Rate of return = 3%		
CRRA = 2 (%)	1.9	3.8	0.8	4.0	3.4
CRRA = 5	2.5	5.3	4.8	4.9	4.7
			Rate of return = 1%		
CRRA = 2	2.6	4.9	0.9	5.1	4.2
CRRA = 5	3.4	7.3	5.9	6.6	6.0
			Husband and wife make Catch-Up contributions		
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
			Rate of return = 3%		
CRRA = 2 (%)	2.7	3.6	3.2	5.5	5.5
CRRA = 5	3.2	4.8	4.9	6.4	6.0
			Rate of return = 1%		
CRRA = 2	3.7	4.9	4.2	7.4	7.2
CRRA = 5	4.8	6.9	6.4	9.3	8.3

Source: Authors' calculations.

Note: 1949 birth cohort. Population average mortality. Scaled high, medium, and low earners. Rates of return are in real (inflation adjusted) terms.

Table 4

COMPARISON OF CATCH-UP WITH COMMERCIAL ANNUITIES – MONTHLY BENEFITS

	Medium earner	High earner
Catch-Up Contributions ($)	238	184
Commercial Annuities		
1% return accumulation and annuity priced using 1% returns ($)	66	108
3% return accumulation and annuity priced using 3% returns ($)	102	168

Source: Authors' calculations.
Note: See text for details.

Table 5

OPTIMAL CONTRIBUTION RATE (%) BY LIFETIME EARNINGS

	Single individuals				
	Maximum	High	Medium	Low	Very Low
Optimal contribution rate – single men (%)	25.1	21.8	10.5	12.9	4.8
Optimal contribution rate – single women	29.5	27.3	17.9	14.0	6.1

	Married couples				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
	Only husband make Catch-Up contributions				
Optimal contribution rate (%)	52.1	48.3	38.2	44.8	34.0
	Husband and wife make Catch-Up contributions				
Optimal contribution rate	8.0	9.2	17.2	5.0	17.3

Source: Authors' calculations.
Note: 1949 birth cohort. Population average mortality. Scaled high, medium, and low earners. CRRA utility with a coefficient of risk aversion of five. Three percent real risk-free rate of return.

Table 6
PROJECTED AFTER TAX RATES OF RETURN (%) ON CATCH-UP CONTRIBUTIONS, SINGLES

	Single men			Single women	
Lifetime earnings	High	Medium	Low	Medium	Low
All (%)	-0.2	3.1	3.4	4.0	4.1
White less than high school	-0.7	2.6	2.8	3.6	3.8
White high school	-0.2	3.1	3.3	4.0	4.2
White some college	0.4	3.7	3.9	4.1	4.4
Black less than high school	-1.7	1.6	1.9	3.0	3.3
Black high school and college	-1.0	2.3	2.6	3.5	3.7
Hispanic	0.4	3.7	3.9	4.1	4.5

Source: Authors' calculates.
Notes: See Table 2.

Table 7
PROJECTED EQUIVALENT CONTRIBUTION RATE (%) BY LIFETIME EARNINGS – TAXES

	Single men			Single women	
	High	Medium	Low	Medium	Low
ECR (%)	3.3	6.3	5.8	6.8	6.2
	(3.8)	(7.4)	(6.5)	(7.9)	(7.0)
	Only husband makes Catch-Up contributions				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
ECR (%)	3.7	3.8	4.8	8.0	7.1
	(4.1)	(4.1)	(4.9)	(8.3)	(8.0)
	Marginal benefit of wife's contributions				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
ECR (%)	2.2	4.6	4.2	4.4	4.1
	(2.5)	(5.3)	(4.8)	(4.9)	(4.7)
	Husband and wife make Catch-Up contributions				
Husband earnings	High	High	High	Medium	Medium
Wife earnings	High	Medium	Low	Medium	Low
ECR (%)	2.8	4.3	4.3	6.0	5.3
	(3.2)	(4.8)	(4.9)	(6.4)	(6.0)

Source: Authors' calculations.
Note: Base case results assuming tax deductibility of Catch-Up contributions are shown in parentheses. CRRA utility with a coefficient of risk aversion of five. Three percent real risk-free rate of return.

Table 8

PROJECTED IMPACT ON SOCIAL SECURITY ACTUARIAL BALANCE

	Valuation period		
	25 years	50 years	75 years
		Current law	
Income rate (%)	14.59	13.99	13.85
Cost rate (%)	16.04	16.32	16.67
Actuarial deficit (%)	–1.45	–2.34	–2.82
		Proposal	
Income rate (%)	15.62	15.08	14.98
Cost rate (%)	16.55	17.25	17.80
Actuarial deficit (%)	–0.93	–2.17	–2.83
Change in actuarial deficit (%)	–0.52	–0.17	0.01

Source: Authors' calculations.

Table 9

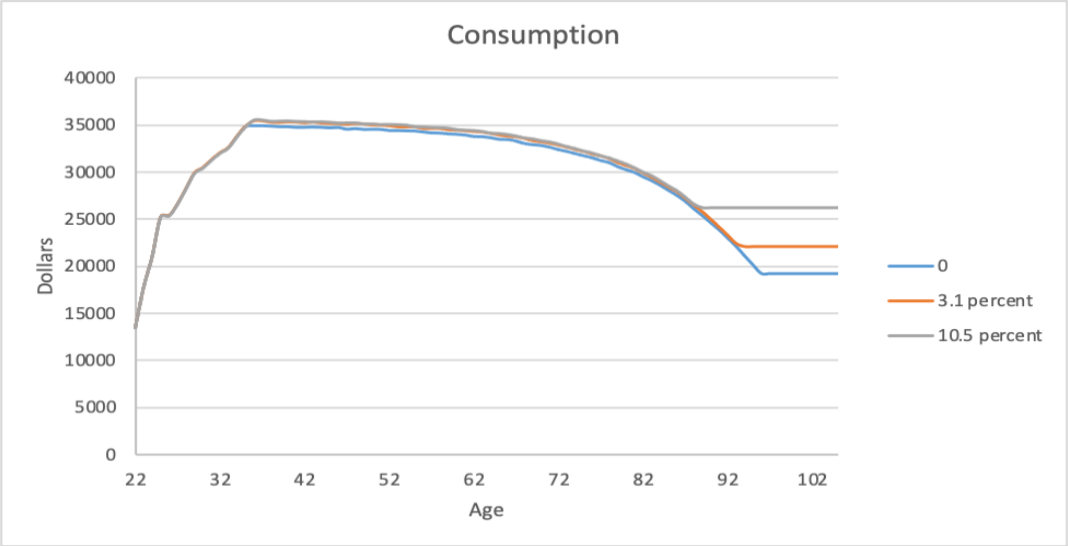
PROJECTED IMPACT ON AGGREGATE BENEFITS AND TAXES

Birth cohort	Additional benefits ($B)	Additional taxes ($B)	Net additional benefit ($B)	Increase benefits (%)	Increase taxes (%)
1950-59	284	249	34	2.7	2.0
1960-69	889	857	32	7.0	5.6
1970-79	1,147	1079	69	8.8	7.1
1980-89	1,481	1359	123	9.0	7.1
1990-99	1,790	1657	134	8.9	7.0
2000-09	2,004	1876	128	8.8	6.9

Source: Authors' calculations/DYNASIM model output.

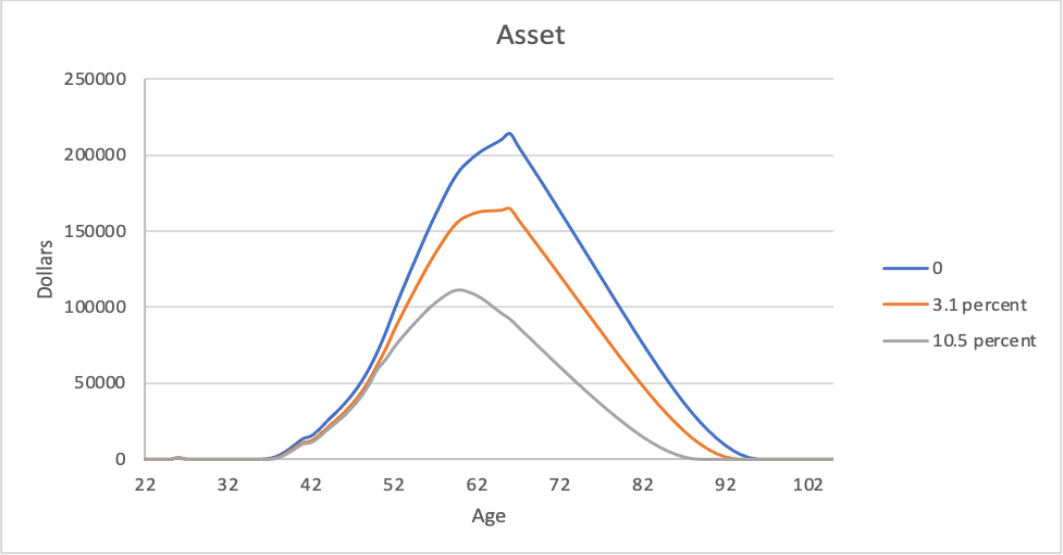
Notes: All amounts are in billions of age-50 dollars discounted using a three percent real interest rate.

Figure 1
MEDIUM EARNER OPTIMAL CONSUMPTION AT ZERO,
3.1%, AND OPTIMAL 10.5% CATCH-UP CONTRIBUTION RATE



Source: Authors' calculations.
Notes: Calculations assume male mortality for the 1949 birth cohort, CRRA utility with coefficient of risk aversion of five, and a three percent real rate of return on financial assets. All amounts are in 2015 Dollars.

Figure 2
MEDIUM EARNER FINANCIAL ASSETS AT ZERO, 3.1%, AND OPTIMAL
10.5% CATCH-UP CONTRIBUTION RATE



Source: See Figure 1.
Notes: See Figure 1.

NONTECHNICAL SUMMARY

Older workers have not been able to save adequately for retirement. The median retirement savings balance for older workers is only $15,000. Our innovative reform proposal, called *Social Security Catch-up Contributions*, enables all workers to purchase extra benefits through Social Security.

All workers at age 50 would be defaulted into Social Security "Catch-Up" contributions of 3.1 percent of salary and credited with a 50 percent bonus in their earnings records. For example, a worker earning $50,000 a year would be credited with earnings of $75,000. The Primary Insurance Amount (PIA) would be based on earnings inclusive of Catch-Up contributions, so that maximum benefits a worker could receive would increase. The proposal uses the progressivity of the Social Security benefit formula to target low and moderate earners, but high income workers also benefit. The proposal would leave Social Security's 75-year actuarial shortfall unchanged and significantly reduce the 25-year shortfall.

The AARP selected this proposal part of its "Innovation Challenge" to Social Security reform. We show that both high and low earners and members of high mortality groups benefit from the additional longevity insurance purchased with Catch-Up contributions, and doing so through Social Security is more attractive than commercial annuities.

The study also helps Social Security's actuarial shortfall. Our plan does not carve individual accounts out of Social Security and it does not restore actuarial balance by increasing the Normal or Full Retirement Age or increase taxable maximum earnings or means testing benefits.

Our model uses plausible beliefs about individuals who want insurance for uncertain lifespans to conclude they will value the program more than the required contribution rate because of the insurance aspect of a Social Security benefit. Also, Social Security is a more efficient way to buy an annuity compared to a commercial annuity.

The political debate about how to close the Social Security actuarial shortfall has vacillated between payroll tax increases versus benefit cuts, with higher income workers taking the brunt of the cuts. Our proposal, on the other hand would help Social Security finances and help all workers in all income groups benefit from paying higher FICA taxes in return for more Social Security benefits, especially since Social Security it the best place to get an efficient inflation – indexed annuity for life.