



Will Your Social Insurance Pay Off? Making Social Security Progressivity Work for Low-Income Retirees

By Andrew G. Biggs

Although the Social Security program is progressive—meaning that the replacement rate of preretirement earnings offered by Social Security tends to rise as lifetime earnings decline—this relationship is erratic. While individuals with lower lifetime earnings receive better treatment on average, lifetime earnings are only a weak predictor of how any one person will be treated by the Social Security program. Many high-earning households receive high replacement rates, and many low-earning households fail to receive them. Thus, Social Security is not entirely effective as a social insurance program protecting low lifetime wage earners against a meager retirement. In order to make Social Security more reliably progressive—thus protecting low-earning workers and allowing them to plan more effectively for their financial future—one possible approach would be to offer a flat dollar benefit for each retiree along with an individual account whose benefits are tied directly to contributions.

Throughout the life of the program, Social Security has been intended to be progressive—that is, individuals with lower lifetime earnings tend to receive higher benefits relative to those earnings, whether viewed in terms of rates of return, replacement rates, or the ratio of lifetime benefits to lifetime taxes.¹ Several features of the program can affect the level of an individual's retirement benefits relative to his earnings and contributions to the program:

- For individuals receiving benefits based upon their own earnings records, the program provides a progressive replacement of lifetime earnings such that benefit replacement rates are higher for individuals with lower lifetime earnings.
- Social Security provides the lower-earning spouse of a married couple the greater of his or her own earned benefit or a spousal benefit equal to one-half that of the higher-earning spouse. As a result, two couples with the same combined earnings can receive different benefits based upon how earnings were distributed between the spouses.
- Spousal benefits are available to divorced individuals, but only if the marriage lasted for ten years or more.
- Social Security benefits are paid as an annuity, lasting as long as an individual lives. Thus, longer-lived individuals will receive higher lifetime benefits, all else being equal, than shorter-lived individuals.
- Social Security benefits are calculated based upon the highest thirty-five years of earnings, such that individuals whose lifetime earnings are concentrated in thirty-five years or fewer receive higher relative benefits than those with longer working careers.
- Social Security levies taxes and calculates benefits based on earnings up to a cap (currently \$102,000). Thus, two individuals with the same lifetime earnings may pay different taxes and collect different benefits based on whether their annual earnings fluctuated above and below the taxable maximum.

Andrew G. Biggs (andrew.biggs@aei.org) is a resident scholar at AEI.

In recent years, a considerable body of research has examined how these and other aspects of the Social Security tax and benefit rules combine to affect progressivity. Most studies suggest that, when viewed on a household basis and measuring taxes and benefits on a lifetime basis, Social Security is on average at least modestly progressive.² However, little research has been conducted on how *consistently* progressive the program is. It is not known whether lifetime lower earners receive reliably better treatment than higher earners. Consistency of progressivity is important if Social Security retirement benefits are to serve a social insurance protecting against low lifetime earnings.

This *Retirement Policy Outlook* is the first attempt to measure quantitatively the consistency of Social Security's progressivity. How reliably do lifetime earnings predict treatment by the Social Security program, viewed either on an individual or a household basis? Even if lower earners receive higher benefit/tax ratios on average, how certain can a low-earning individual be that he will be treated as Social Security intends?

The results of my analysis raise questions about the insurance value of the progressivity of the Social Security benefit formula. Social Security's benefit formula serves as insurance against having low lifetime earnings, providing a form of insurance that is not offered in private markets. Since redistribution to low lifetime earners is offered only on average and not with precision, however, its insurance value to individuals and households planning for their retirement years is reduced.

Social Security Retirement Benefits as Insurance

Social Security's technical name is the Old Age, Survivors, and Disability Insurance program, and it has, almost since its inception, been described as a "social insurance" program. That certain parts of the Social Security program are insurance is obvious: the disability program ensures against illness or injury that prevents a covered worker from taking part in the labor force. The survivors program protects the spouse and children of a covered worker against loss of income due to the death of the worker. Less obviously, the payment of Social Security benefits as an annuity that lasts

until the death of the beneficiary provides protection against longevity risk—the threat of outliving one's assets. The progressivity of the Social Security retirement benefit formula is a central part of the program, but it is less than clear to casual observers what it insures against and how effectively it does so.

Most studies suggest that, when viewed on a household basis and measuring taxes and benefits on a lifetime basis, Social Security is on average at least modestly progressive.

One of the advantages of a mandatory Social Security program is that, through a progressive benefit formula, it can provide insurance against the risk of relatively low lifetime wages.³ Some differences in lifetime income are matters of choice based on individual preferences regarding labor versus leisure or willingness to defer consumption in order to invest either in, say, education or training. Other differences in lifetime earnings, however, are due to factors beyond people's control. Differences in innate skills or abilities, for instance, or technological and trade policy changes that favor one

industry or disadvantage another—the auto industry comes to mind—can significantly increase or lower individuals' lifetime wages.

People might wish to insure against these risks to their lifetime earnings. However, private markets cannot affordably provide insurance against low lifetime earnings due to the effects of adverse selection. Social Security is a near-universal program, covering almost 96 percent of the U.S. workforce. It does not protect against economic fluctuations that produce low earnings in any given year, such as a short-term recession. However, the Social Security benefit formula is designed so that individuals who for whatever reason have below-average wages *over their lifetimes* should receive relatively higher Social Security benefits at retirement.

In this vein, University of Oregon economist Mark Thoma argues that Social Security is fundamentally an insurance program:

It is no different than fire insurance. Without such insurance, people would need to save enough to replace their homes should a fire break out. All risk must be borne individually, and most people end up saving far more than needed compared to an insurance program providing identical benefits. Others are left without any protection at all. With fire insurance, each person pays a smaller amount into a fund, and those unlucky few who need the insurance

collect. There is no expectation that the amount paid in and the amount collected will necessarily match. Social Security insurance is no different.⁴

In this view, Social Security provides extra resources to individuals who, even if they saved out of their own earnings during their working lives, would be unable to provide for a sufficient income in retirement. To the degree that low lifetime earnings are distributed more or less randomly, rather than being a matter of individual choice, such a social insurance program can, in theory, improve outcomes at relatively low cost. Thoma concludes: “The privatization debate has not paid enough attention to the insurance aspect of Social Security. It is social insurance, not an individual savings program, and it is important to recognize why it is optimal for government to provide social insurance collectively rather than leaving it to individuals.”⁵

This is a legitimate point. However, to satisfy this insurance function, it is not enough that Social Security be progressive *on average*. To be truly effective, the Social Security program must be reliably progressive. Just as homeowners’ insurance would be less valuable were the policy uncertain to pay off in the event of a fire, Social Security’s implicit wage insurance becomes less valuable if low earners do not receive consistently higher replacement rates than higher earners. The insurance value of Social Security is degraded to the degree that there is variation in generosity of benefits paid to households with the same level of earnings. Low-earning households should consistently receive higher replacement rates and high-earning households should consistently receive lower replacement rates. The welfare-improving effects of Social Security’s progressivity depend upon how effectively that progressivity is targeted.

How Social Security Benefits Are Determined

Most observers are aware of the basic Social Security benefit formula, which pays benefits as a progressive replacement of lifetime earnings. This basic description does not tell the full story, however, for there are many other factors that can cause benefits to differ from person to person.

In this analysis, the term “lifetime earnings” refers to the present value of total lifetime earnings, including earnings above the taxable maximum. The present value is calculated based on the interest rate earned by new bond issues to the Social Security trust fund. The present value of lifetime earnings is a single figure that allows for comparisons of lifetime purchasing power between individuals whose year-to-year earnings patterns might have been quite different. Most distributional analyses by academics as well

as government agencies—such as the Social Security Administration (SSA), Congressional Budget Office, and Government Accountability Office (GAO)—consider the present value of lifetime earnings to be the best measure of resources available to individuals.

The basic Social Security benefit calculation is begun by first indexing all past earnings to growth in average wages throughout the economy.⁶ The highest thirty-five years of indexed earnings are then averaged and divided by twelve to produce the recipient’s average indexed monthly earnings (AIME). The AIME are

then run through a progressive replacement formula, detailed below, to produce the Primary Insurance Amount (PIA), which is the basic benefit for a retiree claiming at the full retirement age (currently sixty-six).

The PIA formula for a worker who first becomes eligible to receive benefits in 2008 is 90 percent of the first \$711 of AIME plus 32 percent of AIME between \$711 and \$4,228 plus 15 percent of AIME over \$4,228.⁷ Given this formula, we can expect lower-earning individuals to receive a higher replacement rate than higher earning individuals.

The PIA is modified based on the age at which the individual claims benefits. Individuals claiming prior to the full retirement age are subject to an actuarial reduction factor equal to five-ninths of 1 percent of benefits for each month benefits were claimed prior to the full retirement age. Individuals claiming after the full retirement age are eligible for “delayed retirement credits” equal to two-thirds of 1 percent for each month benefits are delayed after the full retirement age through age seventy.

Individuals may also be eligible for benefits based on spousal earnings. If the individual’s earned benefit is less than 50 percent of her spouse’s benefit, then she is eligible for a spousal benefit that would increase their benefit to that 50 percent level. If the individual’s benefit exceeds

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50 percent of her spouse's benefit, however, no spousal benefit is payable.

The progressivity of the basic formula for calculating the PIA dictates that replacement rates should be higher for individuals with lower lifetime earnings. However, there are several ways in which individuals with the same lifetime earnings can receive significantly different benefits.

Wage Indexing of Past Earnings. In calculating AIME, past earnings are first indexed for average wage growth in the economy. This process effectively discounts nominal earnings at the rate of wage growth, while the present value of lifetime earnings discounts earnings at the interest rate earned by the Social Security trust fund. This difference means that two individuals could have the same present value of lifetime earnings but different AIME figures, thereby producing somewhat different benefit amounts.⁸

Thirty-Five-Year Earnings Limit. AIME are calculated based on an individual's highest thirty-five years of earnings. As a result, an individual whose earnings take place entirely within thirty-five years would have higher AIME than an individual with the same lifetime earnings but whose wages were spread out over more than thirty-five years.

Forty-Quarter Eligibility Requirement. To be eligible for Social Security benefits based on their own earnings records, individuals must have forty quarters (roughly ten years) of earnings in Social Security-covered employment. Thus, a single individual whose lifetime earnings take place in less than ten years of employment might not be eligible for benefits, while an individual with the same total lifetime earnings whose earnings took place over more than ten years would be. This effect can produce a kink in the progressivity of the program: individuals who simply meet the forty-quarter requirement will generally have low lifetime earnings and therefore receive high benefits relative to those earnings; an individual who came just short of the forty-quarter requirement might have slightly *lower* lifetime earnings but be ineligible for Social Security benefits. In practice this is uncommon, as retirees with less than forty quarters of covered employment often receive benefits based upon a spouse's record, but in isolated instances it does occur.⁹

Spousal Benefits. As noted above, married individuals may be eligible to receive a spousal benefit in addition to a benefit based upon their own earnings record. Couples with the

same total lifetime earnings can receive very different benefits based on the distribution of earnings between spouses. A couple in which one spouse had all the earnings would receive significantly more benefits than a similar couple in which earnings were evenly divided between spouses.

Ten-Year Divorced Benefit Requirement. A divorced individual may be eligible for a spousal benefit based on the earnings record of a former spouse if the marriage lasted at least ten years. As a result, individuals with the same lifetime earnings may receive different replacement rates based on whether their marriage lasted nine years and eleven months or ten years.

Claiming Age. As noted above, benefits differ based on the age at which an individual claims them. Benefits claimed at age seventy are roughly double those available at age sixty-two, meaning that individuals with the same lifetime earnings can have different replacement rates based on when they choose to claim benefits. However, because this difference in replacement rates is a function of an individual choice, my analysis controls for differences in claiming ages.

Maximum Taxable Wage. Social Security taxes are collected and benefits calculated based on earned income up to a given maximum. In 2008, this maximum taxable wage was \$102,000, a value that increases each year along with the growth of average wages in the economy. Above this earnings level, individuals neither pay taxes nor become eligible for additional benefits. As a result, Social Security can levy different levels of taxes and pay different levels of benefits to individuals with identical lifetime earnings depending upon the degree to which annual earnings fluctuated above the maximum taxable wage.

A common strand among several of these provisions is that, although they may increase progressivity on average, they also introduce non-earnings-related benefit criteria and thereby increase the variability in benefits between individuals with the same lifetime earnings.

Modeling Social Security's Progressivity

This *Retirement Policy Outlook* estimates replacement rates using a microsimulation model of the Social Security population. This analysis employs a suite of models developed and maintained by the Policy Simulation Group (PSG).¹⁰ The PSG suite of models, which include the SSASIM,

GEMINI, and PENSIM models, is used by the GAO, the Department of Labor, and SSA's Office of Retirement and Disability Policy for their own analytical work, as well as by nongovernmental organizations such as the Employee Benefit Research Institute (EBRI).

The SSASIM model is used to input starting values for a number of variables, as well as projected future economic and demographic outcomes, which are keyed to those projected by the Social Security trustees.¹¹ The PENSIM model creates thousands of life histories based on these inputs, including educational attainment, labor force participation, earnings, job mobility, marriage, disability, childbirth, retirement, and death. These life histories have been validated by the PSG against data from the Census Bureau's Survey of Income and Program Participation and Current Population Survey, SSA's Modeling Income in the Near Term, and the Panel Study of Income Dynamics from the Institute for Social Research, as well as against the intermediate cost projections from the Social Security trustees and data provided by SSA's Office of the Chief Actuary.

The GEMINI model simulates Social Security benefits and taxes for the population created by PENSIM. GEMINI can perform distributional analysis of a large sample of a single birth cohort (as I do here) or create multiple overlapping cohorts to analyze long-term Social Security financing. GEMINI models Social Security benefits for retired workers, spouses, survivors, and the disabled, under both current law and potential reforms to the program.

For the core analysis conducted here, Social Security taxes and benefits are simulated under current law for the 1940 birth cohort. Simulations were based on the Social Security trustees' 2007 intermediate economic and demographic assumptions. Analysis of replacement rates is conducted by comparing Social Security benefits as of age seventy to a smoothed income level derived from the present value of lifetime earnings. Age seventy was chosen to minimize the number of Social Security-eligible individuals who had yet to claim benefits as of the year of analysis. The sample population as of age seventy totaled 25,071 individuals; the spouses of these individuals, who may be of different ages, are included in this sample when analysis is conducted on a couple basis. Individuals who received disability benefits or otherwise claimed benefits prior to age sixty-two are excluded from the sample, as are individuals who claimed benefits after age seventy. Individuals who immigrated to the United States after age

twenty-five are also excluded from the sample. In addition, differences in benefits due to claiming age were controlled for by setting values for the actuarial reduction factors and delayed retirement credits at zero.¹²

The Progressivity of Individual and Couple Benefits

My initial analysis compares individual and couple replacement rates to lifetime earnings. As noted above, lifetime earnings are defined as the present value of all lifetime earnings, including earnings above the taxable maximum, discounted at the interest rate earned by the Social Security trust funds. Replacement rates are defined as the total annual benefit received as of age seventy divided by an annualized earnings stream derived from the present value of lifetime earnings.¹³

I use replacement rates instead of measures that rely on lifetime benefits, such as the internal rate of return or the benefit-to-tax ratio, to reflect the fact that part of Social Security's insurance function is to protect against uncertainty in longevity. Social Security's progressivity would be lower if measured relative to lifetime benefits, due to the fact that individuals with lower earnings tend to have shorter life expectancies than those with higher earnings. However, as Jeffrey R. Brown of the University of Illinois at Urbana-Champaign writes, even individuals with shorter life expectancies may benefit from the protection against longevity risk that Social Security's annuity structure provides.¹⁴ For those interested in a lifetime perspective, it is fair to say that the program's progressivity would be lower, and the targeting of its progressivity less precise, if measured in terms of lifetime benefits rather than replacement rates.

Figure 1 shows the results of the GEMINI model simulation for the 1940 birth cohort as of age seventy. Median replacement rates for individuals and couples are calculated by percentiles of the lifetime earnings distribution.¹⁵ Both individual and couple benefits are progressive, meaning that median replacement rates decline as lifetime earnings rise. For instance, at the twentieth percentile of the earnings distribution, the median couple replacement rate is 59 percent of preretirement earnings; at the fiftieth percentile, it is 46 percent; and at the eightieth percentile, it is 32 percent. Similar patterns hold at the individual level.

These findings regarding Social Security's progressivity are not unlike those of other researchers.¹⁶ They serve here as a starting point for the discussion of how well targeted the program's redistribution is.

Targeting of Individual Benefits

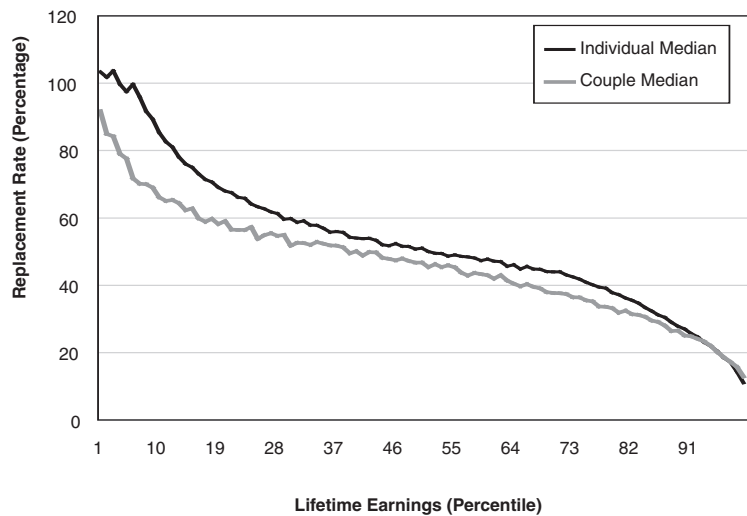
Figure 1 illustrates that Social Security replacement rates are generally progressive by lifetime earnings, whether measured on an individual or a couple basis. On average, as lifetime earnings rise, the replacement rate—the ratio of Social Security benefits to pre-retirement annual earnings—declines.

An individual at the fiftieth percentile of the earnings distribution—a median earner—could expect a replacement rate of 51 percent of preretirement earnings. An individual at the twentieth percentile could expect a replacement rate of 68 percent, while an individual at the eightieth percentile could expect a replacement rate of just 37 percent. Thus, we can conclude that, at the individual level, Social Security replacement rates are progressive on average.

However, as figure 2 illustrates, this effect is true only *on average*.¹⁷ When the line signifying median values is replaced by actual data points, replacement rates can differ markedly at any given level of lifetime earnings. This indicates that redistribution by earnings level is not the only, nor possibly even the predominant, factor determining how well individuals are treated by the Social Security program. Many other factors play significant roles in determining replacement rates.

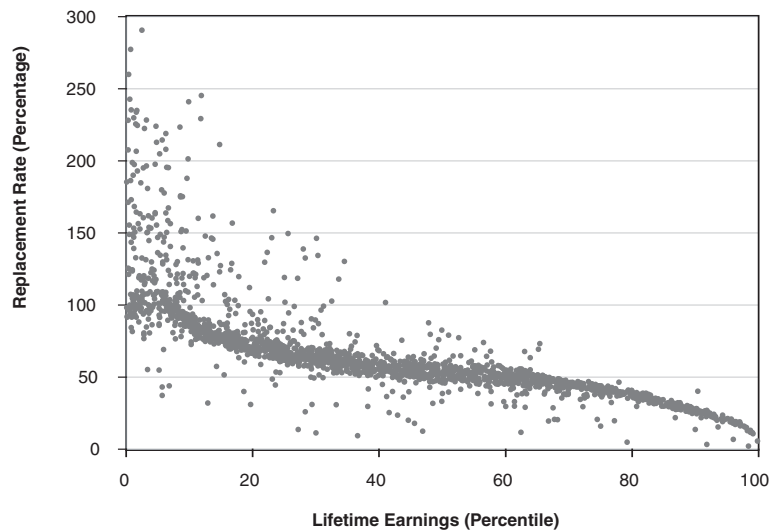
A simple linear regression analysis finds that individual replacement rates tend to equal 99 percent minus 0.88 times the individual's place in the lifetime earnings distribution.¹⁸ An individual at the fiftieth percentile of the earnings distribution, for instance, would have a predicted replacement rate of 55 percent. But it is important to know how accurate these predictions would be. As it turns out, individual lifetime earnings are a poor predictor of individual replacement rates. The tightness of the fit of a regression is measured by a statistic known as R-squared, which indicates the fraction of differences in the dependent variable explainable by differences in the independent variable.¹⁹ Only 31 percent of differences in individual replacement rates can be

FIGURE 1
INDIVIDUAL AND COUPLE MEDIAN REPLACEMENT RATES BY LIFETIME EARNINGS



SOURCE: Author's calculations.

FIGURE 2
INDIVIDUAL REPLACEMENT RATES BY LIFETIME EARNINGS



SOURCE: Author's calculations.

explained by differences in individuals' lifetime earnings. The remaining differences—69 percent—are attributable to other factors, particularly the many facets of the benefit formula that can cause individuals with identical lifetime earnings to receive different retirement benefits.

Moreover, the variation in replacement rates is greater at lower earnings percentiles than higher ones.²⁰ The standard deviation of replacement rates declines as earnings rise, as does the coefficient of variation of replacement rates. For instance, at the first percentile of the earnings distribution, the standard deviation of individual replacement rates is 104 percent, falling to 12 percent by the fiftieth percentile and 2 percent by the one hundredth percentile. The coefficient of variation (the standard deviation divided by the mean value) declines from 70 percent for individuals at the first percentile to 23 percent at the fiftieth percentile, rising slightly to 31 percent at the one hundredth percentile.²¹

These findings indicate that Social Security poorly targets individual replacement rates by earnings level, particularly for low-earning individuals. However, household-level evaluation is a better measure of the Social Security program's efficacy as social insurance, and in the following section, I focus on total benefits received by couples.

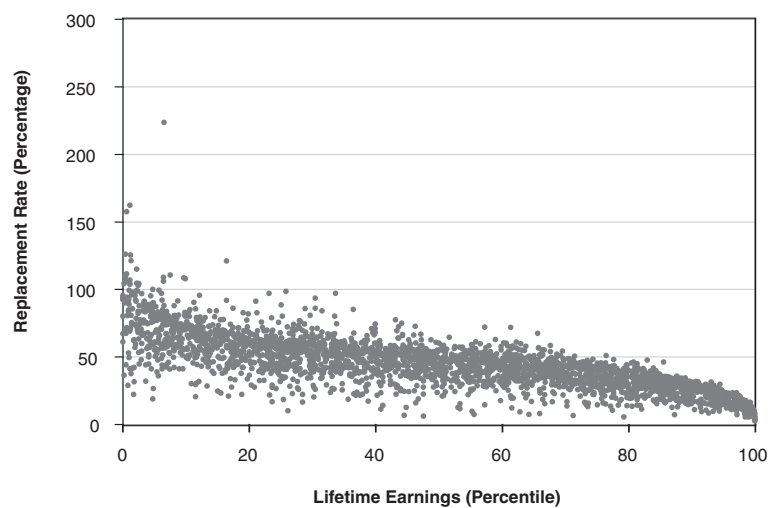
Targeting of Couple Benefits

While individual benefits are worth examining, it is preferable to analyze the relationship between earnings and benefits on a household basis, as members of a couple usually share income and costs over time. It is conventional for Social Security policy analysis to focus on households using a "shared" approach in which a couple's earnings, taxes, and benefits are evenly shared between spouses at any time in which they are married. My analysis employs a shared approach.

Figure 3 illustrates the distribution of replacement rates by couple earnings percentile, again for couples in the 1940 birth cohort.²² As with individual replacement rates, the data points tend to have a negative slope, indicating that Social Security replacement rates for couples are progressive on a household basis.

A linear regression confirms this progressivity. The best projection for a couple's Social Security replacement rate is 71 percent minus 0.53 times their percentile ranking in the lifetime earnings distribution.²³ The less negative slope of the couples' regression line relative to individuals' indicates that Social Security is less progressive when viewed on a

FIGURE 3
COUPLE REPLACEMENT RATES BY LIFETIME EARNINGS



SOURCE: Author's calculations.

couples basis than when viewed individually. Put another way, much of Social Security's redistribution is simply from higher- to lower-earning spouses within the same couple. When viewed as a single unit, this redistribution disappears.

The regression also indicates that couples replacement rates are only poorly associated with their lifetime earnings. The R-squared value of the linear regression indicates that around 55 percent of the difference in couples' replacement rates can be accounted for by differences in their lifetime earnings. Put another way, 45 percent of the difference in couples' Social Security replacement rates—nearly half—is due to factors other than differences in their lifetime earnings.

It is again worth pointing out that these results are based upon replacement rates as of age seventy, not total lifetime benefits, and therefore do not reflect variation in lifetime benefits attributable to differential mortality. Most studies of Social Security progressivity have focused on lifetime benefits rather than replacement rates, although I employ replacement rates because of the insurance focus of this *Outlook*. For reference, however, a regression of the present value of couples' lifetime earnings on the present value of lifetime benefits produces an R-squared value of 0.27, indicating that almost three-quarters of differences in lifetime benefits is due to factors other than differences in lifetime earnings.

Figure 4 shows the distribution of replacement rates within a given percentile of the lifetime earnings

distribution. The dark gray area shows the interquartile range of replacement rates within a given level of lifetime earnings, representing the range from the twenty-fifth through seventy-fifth percentiles. The solid black and light gray areas show distributions between the seventy-fifth and ninetieth percentiles and the tenth and twenty-fifth percentiles, respectively. At any given level of lifetime earnings, a significant share of households receives replacement rates well above or well below the typical value.

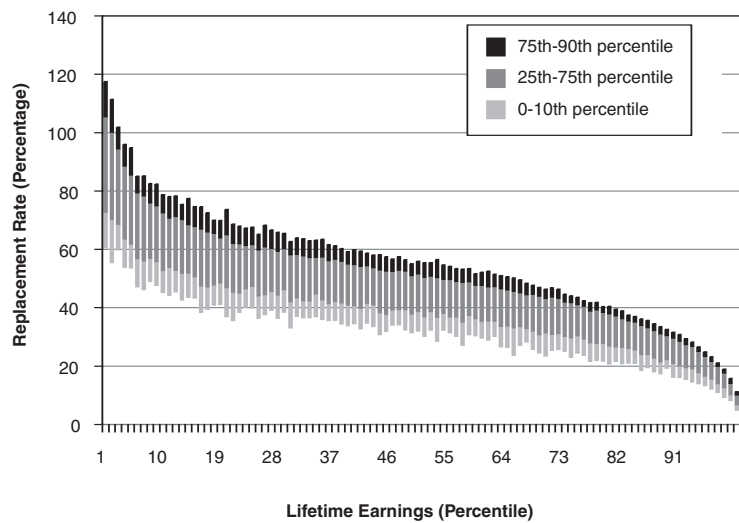
Consider, for example, couples at the twentieth percentile of the lifetime earnings distribution. These couples are very low earners, with lifetime earnings equal to only 55 percent of the median and 41 percent of the mean. Here, the median couple replacement rate is 59 percent. The interquartile range of 47–65 percent signifies that one quarter of couples at the twentieth percentile receive replacement rates below 47 percent, with another quarter receiving replacement rates above 65 percent.

At the fiftieth percentile of the earnings distribution, the median replacement rate is 46 percent. The variation in replacement rates at lower earnings levels leads to a disturbing finding: almost one quarter of couples at the twentieth percentile of the earnings distribution receive a lower replacement rate from Social Security than the typical couple at the middle of the earnings distribution, despite having lifetime earnings barely half as large.

Going further, 10 percent of couples at the twentieth percentile of lifetime earnings receive replacement rates below those received by the typical couple at the seventieth percentile of lifetime earnings, despite lifetime earnings at the twentieth percentile being less than 40 percent of those at the seventieth percentile. For these nontrivial fractions of low-earning couples, it can be argued that their Social Security insurance has failed to “pay off.”

Thus, the insurance value of Social Security retirement benefits is potentially far lower than analysis of Social Security’s progressivity alone would indicate. A low earner has the expectation of receiving a higher replacement rate, just as the holder of a stock has the expectation of receiving a higher rate of return, but in neither case is this outcome guaranteed. The goal of insurance is to smooth consumption in the face of financial disruptions. But as these results illustrate, there is considerable uncertainty about

FIGURE 4
DISTRIBUTION OF COUPLE REPLACEMENT RATES



SOURCE: Author’s calculations.

the replacement rates that households can expect—even among those with the same lifetime earnings.

Adjusting Social Security Progressivity for Risk

It is possible to estimate the costs of Social Security benefit uncertainty to the program’s progressivity by calculating what is called a “certainty-equivalent” replacement rate. Financial theory states that individuals would be willing to accept a replacement rate below the average for their earnings level if they could receive that replacement rate with certainty, much as investors accept the low—but safe—returns offered by bonds in order to avoid the risk involved with holding stocks. This certainty-equivalent replacement rate will always be lower than the average for a given earnings level, but how much lower depends upon how risk-averse we assume individuals to be.

Economists use a measure known as the coefficient of relative risk aversion. A coefficient value of zero indicates the unrealistic assumption that individuals are indifferent to risk. Economists tend to use values between one and three, although recent research derived from survey responses has indicated a median value of 6.3.²⁴

To illustrate, consider couples whose earnings place them at the twentieth percentile of the lifetime earnings distribution, at which the average replacement rate is

57 percent with a standard deviation of seventeen percentage points. Assuming a coefficient of relative risk aversion of three, these couples would be willing to accept a reduced but certain replacement rate of 43 percent to avoid the uncertainty inherent under current law.

Figure 5 illustrates risk-adjusted replacement rates using a variety of assumptions regarding individuals' tolerance for risk.²⁵ The upper line illustrates average couples' replacement rates by lifetime earnings level. The lower lines illustrate certainty-equivalent replacement rates calculated assuming different levels of risk aversion. While certainty-equivalent replacement rates are always lower than average replacement rates, risk-adjusted replacement rates decline most for low earners because variations in replacement rates are highest at low earnings levels. High earners, whose replacement rates are relatively predictable, see smaller reductions as their replacement rates are adjusted for risk. As a result, Social Security is less progressive when viewed from this perspective.

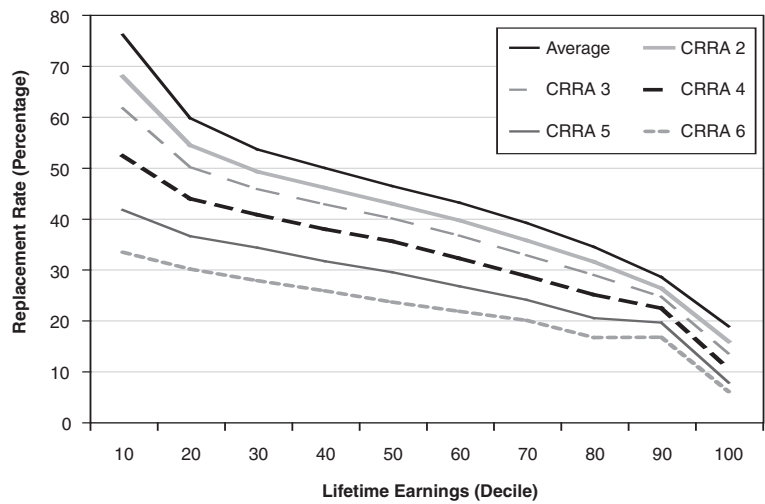
Moreover, if low-earning individuals are more risk averse than high earners, as common sense and some research indicates, then the flattening of replacement rates by lifetime earnings could be more extreme than shown here. What these calculations tell us is that Social Security's progressivity, adjusted for variations in benefits, could be significantly lower than simple measures of replacement rates would indicate.

A Policy Alternative

While the examples above indicate potential failures in the social insurance function of Social Security, they also represent potential opportunities: with better targeting of benefits, it may be possible to improve Social Security's insurance against low income in retirement without necessarily changing either average benefit levels or the progressivity of Social Security benefits.

I propose here an alternative to target progressivity and then compare it to that of current-law Social Security. The proposal envisioned here combines a first-tier flat dollar benefit paid to each worker—regardless of prior earnings—with a second-tier benefit that is based entirely on earnings. The first-tier benefit resembles the “universal pension”

FIGURE 5
AVERAGE AND CERTAINTY-EQUIVALENT REPLACEMENT RATES



SOURCE: Author's calculations.

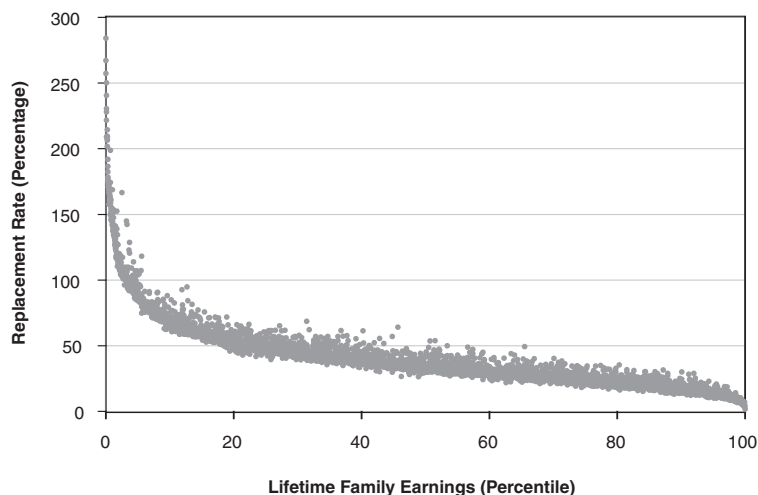
concept that has been adopted in a number of countries, including New Zealand.²⁶ It would pay a flat dollar benefit to each individual of retirement age, regardless of prior earnings or labor force participation. The first tier would focus on redistribution to low earners, fulfilling the traditional “adequacy” goal of Social Security benefits. The flat dollar benefit would overlap functions of both Social Security and the means-tested Supplemental Security Income (SSI) program.

The second tier benefit would be entirely earnings-related, fulfilling the “equity” role of Social Security in paying benefits correlated to contributions. The earnings-related benefit could be based upon contributions to a personal account. In practice, this account could be funded either out of the existing payroll tax or from additional funds, or it could be a notional personal account financed on a pay-as-you-go basis.²⁷ The account is assumed to be invested entirely in government bonds earning the same return as those issued to the Social Security trust funds. At retirement, the proceeds of the personal account would purchase either a single life annuity or a joint and two-thirds survivor annuity, depending upon the marital status of the retiree.

Under this alternative approach, many of the factors that cause variation in replacement rates under the current Social Security benefit formula would be reduced or eliminated.

- Benefits would be paid to all retirees, even those who failed to achieve forty quarters of covered employment.
- Employment in excess of thirty-five years would increase benefits proportionately through the earnings-related account.
- As spousal benefits would no longer be paid, total household benefits would not depend on how earnings were distributed between spouses, nor would a divorced individual's benefits depend upon the length of his or her former marriage.
- Contributions to the earnings-based second tier would compound at the government bond rate, making benefits more closely proportionate to lifetime earnings than under the wage-indexing of earnings used in the current AIME calculation.

FIGURE 6
 COUPLE REPLACEMENT RATES BY LIFETIME EARNINGS
 (Personal Account Plus Flat Dollar Benefit, 1990 Birth Cohort)



SOURCE: Author's calculations.

For rough comparative purposes, I simulated this stylized proposal applied to the 1990 birth cohort. Current law would be altered so that each individual would invest 3 percent of his taxable earnings in a personal account invested in government bonds. This account balance would be annuitized at retirement. In addition, each individual would receive a monthly benefit equal to \$600, wage-indexed from 2006. This signifies that the flat monthly benefit would be equal to around 18.6 percent of the average wage in the economy at the time.

Two things are worth noting about this proposal. First, it is not designed to pay higher or lower benefits than current law; that is a separate policy choice. Second, it is not designed to be more or less progressive than current law. That, too, is a separate policy choice. With the exception of very low earners, who receive higher replacement rates under this plan than under current-law Social Security—in this respect, the modeled reform covers some of the functions of the SSI program—the slope of the decline in replacement rates as lifetime income increases is roughly comparable to that of current law. Higher or lower average benefits or more or less progressivity could be achieved by varying the absolute and relative sizes of the flat benefit and personal account.

The focus here is neither on the generosity nor the progressivity of replacement rates, but on the tightness of fit between replacement rates and earnings levels. Figure 6 shows couples' replacement rates by lifetime earnings

level. As with prior figures, benefit adjustments for early or delayed retirement have been eliminated to control for differences in claiming age. Visually, it is clear that the modeled reform has a significantly tighter fit of replacement rates to lifetime earnings levels. An individual of a given level of lifetime earnings can count on receiving a replacement rate more comparable to others at the same earnings level. Low earners more reliably receive higher replacement rates, while high earners more reliably receive lower replacement rates. In addition, the relative simplicity of the modeled approach may make future retirement benefits more predictable, thereby assisting individuals in planning their non-Social Security retirement saving.

In this way, the model reform potentially improves the insurance value of the Social Security retirement program. While there remains some variation in replacement rates by lifetime earnings level—primarily due to the inheritance of personal account assets from deceased spouses—the level of variation is significantly lower than under current law. The R-squared of an exponential regression that better accounts for very high replacement rates at low earnings levels is 0.89. This indicates that only 11 percent of the difference in replacement rates is explained by factors other than differences in lifetime earnings, versus 45 percent under the current benefit formula.

There are other ways that Social Security can improve the targeting of benefits by lifetime earnings, and it need

not be done though the combination of a flat benefit and personal account suggested here. However, this does show that alternate policy structures may accomplish the social insurance goals of Social Security more effectively than the current benefit structure does.

Conclusion

Most analyses of Social Security and reform alternatives focus on the average level of benefits provided and the degree of redistribution between high and low earners. In econometric terms, most analysis focuses either on progressivity (the slope of the regression line) or on generosity (the intercept of the line with the vertical axis) but not the R-squared (how well the regression predicts actual replacement rates). My findings in this *Retirement Policy Outlook* imply that this third factor—the consistency with which Social Security delivers progressivity to lower earners—is equally important.

The insurance value of Social Security retirement benefits depends on the degree to which progressivity is reliably applied across the beneficiary population. While Social Security is progressive on average, it is far from consistently progressive. Many low earners receive low replacement rates, and many high earners receive high replacement rates. Nearly half the differences in households' treatment by the Social Security retirement program are explained by factors other than differences in their lifetime earnings.

The significant variation in replacement rates, even among households with similar earnings, undermines Social Security's effectiveness as social insurance against low lifetime earnings. Low-earning households cannot rely on receiving a relatively generous Social Security benefit, while a significant number of high earning households will receive generous benefits that they neither need nor expect. Adjusted for uncertainty regarding retirement benefits, Social Security's progressivity may be significantly lower than a cursory view of the benefit formula might imply.

While incremental reforms within the existing Social Security benefit formula could improve the targeting of its progressivity, a relatively simple combination of a flat dollar benefit paid to all retirees plus a personal account paying benefits proportionate to earnings could replicate the average progressivity in Social Security while improving the targeting of redistribution, thus improving the social insurance value of the Social Security program.

AEI research assistant Adam Paul worked with Mr. Biggs to produce this Retirement Policy Outlook.

Notes

1. The internal rate of return (IRR) is the discount rate at which the present value of lifetime taxes equals the present value of lifetime benefits. The IRR can be viewed as akin to an interest rate on an investment. The replacement rate is the ratio of annual benefits in retirement to annual earnings during working years and represents the ability of Social Security benefits to replace income lost due to retirement. The "money's worth" ratio of benefits to taxes is the present value of lifetime benefits divided by the present value of lifetime taxes. A ratio greater than one implies that the individual receives a subsidy from the program, while a ratio less than one implies that the individual pays a subsidy to the program.

2. See Eugene C. Steuerle, Adam Carasso, and Lee Cohen, "How Progressive Is Social Security and Why?" (Straight Talk on Social Security and Retirement Policy 37, Urban Institute, Washington, DC, May 1, 2004), available at www.urban.org/publications/311016.html (accessed December 15, 2008); Jeffrey B. Liebman, "Redistribution in the Current U.S. Social Security System" (Working Paper 8,625, National Bureau of Economic Research, Cambridge, MA, December 2001), available at www.nber.org/papers/w8625 (accessed November 19, 2008); and Alan L. Gustman and Thomas L. Steinmeier, "How Effective Is Redistribution Under the Social Security Benefit Formula?" (Working Paper 7,597, National Bureau of Economic Research, Cambridge, MA, March 2000), available at www.nber.org/papers/w7597 (accessed November 19, 2008).

3. Put another way, current-law Social Security can protect against idiosyncratic risk that affects isolated individuals but not against systemic risk of low wages throughout the population. A pure pay-as-you-go program can spread systemic risk of low wages over several generations, but under current law, Social Security provides only limited protection in this regard as benefit entitlements are almost entirely a function of individual earnings and economy-wide wage growth during the period the individual is of working age.

4. Mark Thoma, "Social Security Is about Insurance, Not Savings," *Register Guard* (Eugene, OR), February 24, 2005, available at http://economistsview.typepad.com/economistsview/2005/03/_social_securit.html (accessed December 15, 2008).

5. *Ibid.*

6. Past earnings are wage-indexed to age sixty. In effect, this implies that earnings in a year prior to age sixty are first measured as a percentage of the average wage at the time, then converted to a comparable percentage of the average wage as of sixty.

7. In 2008, the formula for calculating the PIA is $PIA = 0.90 \times \min[AIME, \$711] + 0.32 \times \max[0, (\min[AIME, \$4,228] - \$711)] + 0.15 \times \max[0, AIME - \$4,228]$. Only earnings up to the maximum taxable amount in each year are used in the basic benefit formula. In 2008, the maximum taxable amount was

\$102,000, and the maximum benefit for a worker retiring at the full retirement age was \$2,205 per month.

8. In general, an individual with a steeper age-earnings profile, meaning that wages begin lower but increase faster, would have higher average indexed monthly earnings and higher benefits than an individual with a shallower age-earnings profile, assuming the present value of lifetime earnings are equal between the two.

9. Forthcoming research conducted under a grant from the National Academy of Social Insurance will explore eligibility issues in greater detail. Also note that the forty-quarter eligibility requirement does not apply to disabled individuals who transfer to the Social Security retirement program at the full retirement age.

10. For more information on the PSG models and model validation, see www.polsim.com.

11. This analysis uses the GEMINI model with values from the 2007 Social Security trustees' report (Board of Trustees, Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, *The 2007 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds* [Washington, DC: Government Printing Office, 2007], available at www.ssa.gov/OACT/TR/TR07/ [accessed December 15, 2008]).

12. In this way, the model produces what might be described as a modified Primary Insurance Amount, adjusted to include any spousal benefits for which the individual is eligible.

13. The denominator in the replacement rate calculation is a wage-indexed stream of earnings extending from age twenty-one through sixty-five with the same present value as the individual or couple's lifetime earnings. The definition of the denominator in the replacement rate calculation is roughly comparable with replacement rate figures published in the Social Security trustees' report. While the manner in which lifetime earnings are converted to an annual income stream will affect the average level of replacement rates, it should not affect measured progressivity or variation in replacement rates by earnings level.

14. Jeffrey R. Brown, "Differential Mortality and the Value of Individual Account Retirement Annuities" (Working Paper 7,560, National Bureau of Economic Research, Cambridge, MA, February 2000), available at www.nber.org/papers/w7560 (accessed November 19, 2008).

15. Mean replacement rates, not shown, are generally similar to median values, signifying that deviations from the mean value for a given earnings level tend to be uniformly distributed.

16. For instance, see Congressional Budget Office, "Is Social Security Progressive?" *Economic and Budget Issue Brief*, December 15, 2006, available at www.cbo.gov/ftpdocs/77xx/doc7705/12-15-Progressivity-SS.pdf (accessed December 15, 2008); Eugene C. Steuerle, Adam Carasso, and Lee Cohen, "How Progressive Is Social Security and

Why?"; Jeffrey B. Liebman, "Redistribution in the Current U.S. Social Security System"; and Alan L. Gustman and Thomas L. Steinmeier, "How Effective Is Redistribution Under the Social Security Benefit Formula?"

17. Figure 2 and following figures use a representative subsample of data points for clarity of presentation. Regressions and other calculations are based on the full GEMINI output sample.

18. Replacement rates can be predicted by the equation $rep_rate = 0.99 - 0.88earnings_percentile$.

19. An R-squared value of one would indicate that 100 percent of differences in the dependent variable are explainable by differences in the independent variable; a value of zero would indicate that the independent variable has no power to explain differences in the dependent variable. The linear regression of individual lifetime earnings on individual replacement rates produces an R-squared value of 0.31.

20. Put in econometric terms, it is a textbook example of heteroscedasticity, in which deviations from the projected value are not uniform through the sample.

21. For couples, the standard deviation of replacement rates is 90 percent at the first percentile of the earnings distribution, 22 percent at the fiftieth percentile, and 5 percent at the one hundredth percentile. The coefficient of variation for couples is 79 percent at the first percentile, 34 percent at the fiftieth percentile, and 41 percent at the one hundredth percentile.

22. For each couple, there is a primary individual who is a member of the 1940 birth cohort and a spouse who may be older or younger.

23. For couples, the relationship between earnings and replacement rates is described through $rep_rate = 0.71 - 0.53earnings_percentile$.

24. See Miles S. Kimball, Claudia R. Sahm, and Matthew D. Shapiro, "Imputing Risk Tolerance from Survey Responses" (Working Paper 13,337, National Bureau of Economic Research, Cambridge, MA, August 2007), available at www.nber.org/papers/w13337 (accessed December 22, 2008).

25. Certainty - equivalent replacement rates are calculated using a utility function $u(x) = \frac{x^{1-a}}{1-a}$ where x denotes the Social Security replacement rate and a represents the coefficient of relative risk aversion. A utility value is calculated for each individual's Social Security replacement rate. The expected utility of Social Security benefits is calculated by averaging utility values for individuals at a given earnings level. This expected utility value is then converted back to a certainty-equivalent replacement using the same utility function.

26. New Zealand is an example of a developed country with a universal, noncontributory pension system; a number of developing countries have introduced universal pensions, in part due to their lack of administrative complexity.

27. The account funding source is not important for these distributional questions, although it is significant in other contexts.