Policies to Improve the Resiliency of Long-Term Social Security Financing

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ABSTRACT: While Social Security is projected to begin running deficits within the next decade and become insolvent during the early 2040s, a significant degree of uncertainty accompanies these projections. This uncertainty causes some to argue for delay in addressing projected deficits.

Moreover, some proposed reforms would increase uncertainty regarding future system financing. This paper examines policies to index Social Security taxes or benefits to changes in the ratio of workers to beneficiaries, allowing for auto-correction for changing demographic factors that impact system finances.

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Executive Summary

With the expectation of significant future deficits in the Social Security program, it makes sense to enact reform as soon as feasible in order to spread the burdens of reform over a larger number of generations. Doing so reduces the size of changes on any particular generation, which is both fairer and more economically efficient. However, projections of Social Security's financial future are highly uncertain, due to the impossibility of knowing the future values of the underlying demographic and economic variables which determine the program's financing. Varying rates of wage growth, immigration, fertility, mortality, interest rates and other factors can significantly alter Social Security's future financial status.

This uncertainty is one of the greatest obstacles to reform. It leads some individuals to question whether Social Security reform is even necessary. For others, it constitutes a convenient excuse to put off action for another day. Even for those who believe reform is almost certainly needed, uncertainty in future outcomes leaves the possibility that a given set of reform options could over- or under-balance the program's finances.

Most proposed reforms aim to restore solvency consistent with the Social Security Trustees *intermediate* cost projections. Yet the intermediate projection is only one likely point estimate. Alternatively, stochastic simulations designed to quantify uncertainty regarding future Social Security financing show a wide range of possible outcomes. A reform plan that targets the intermediate projections will almost certainly be either over- or -under-financed. Moreover, some reforms would *increase* the

uncertainty surrounding financing projections. Thus "sustainable solvency" under intermediate projections may not produce what we might call "resilient" or "robust" solvency that would hold under a wide range of possible conditions.

Herein I propose a class of reforms designed to auto-correct for changes in the major demographic factors affecting Social Security financing. In particular, these reforms would index Social Security tax rates and initial retirement or disability benefits to changes in the ratio of workers to beneficiaries. While Social Security requires significant structural reforms in addition to changes in revenues and outlays to balance its finances, indexing to the worker-beneficiary ratio allows for not merely expected solvency, but solvency that is resilient to a wide range of future outcomes.

Introduction

> "It is our view that the Social Security Administration must develop different techniques for measuring uncertainty—not merely to refine predictions but to allow policy makers to consider reforms to Social Security that would lessen its sensitivity to adverse economic and demographic trends." *1999 Technical Panel on Assumptions and Methods*

Both the Social Security Trustees and the Congressional Budget Office (CBO) project that the Social Security program will experience significant funding shortfalls in the future. The program will run cash deficits beginning in about 10 years, and the trust fund is projected to be insolvent in the 2040s. While this is a long time by the standards

of a typical government program, whose resources and spending are decided on a year-to-year basis, Social Security's taxes and benefits stretch from the moment an individual enters the workforce until the day that person dies. Social Security taxes are the largest tax for a majority of workers, and its benefits form a significant part of total retirement income. As a result, any changes to the tax and benefit schedules should be undertaken with as much notice as possible.

A significant impediment to enacting timely reform is the considerable uncertainty regarding projections of Social Security's future finances, which require estimates of a large number of economic and demographic factors extending decades into the future. Some argue for a "wait and see" approach to Social Security reform, claiming that it is possible that Social Security will remain solvent without legislative action. Premature action, this argument holds, would subject Social Security participants to tax increases and benefit reductions that may, in the end, turn out to be unnecessary. Whether made out of conviction or political convenience, this argument has obvious intuitive appeal. Both the Trustees and CBO note there is almost no chance the program will remain solvent in perpetuity without reform. Nevertheless, these arguments resonate at a political level.

Substantively, even if one accepts the need for prompt action, uncertainty regarding future outcomes makes the efficacy of reforms difficult to gauge. If the intermediate forecast for Social Security's finances is taken to be the median outcome of a distribution of possible results, then policies that make Social Security solvent based

on the intermediate forecast have a 50 percent chance of overbalancing the program and a 50 percent chance of not making the system fully solvent.

From the point of view of generational equity, over- or under-balanced solutions are less than perfect. If we overbalance the program, we have imposed on earlier generations larger tax increases or benefit reductions than are necessary; if we fail to make Social Security fully solvent, we leave larger tax increases and benefit reductions to future generations. In either case, uncertainty imposes costs on both policymakers and on participants.

This paper proposes policies to help address uncertainty in Social Security's future financing. It does not advocate for a single specific approach to fixing Social Security with regard to tax increases or benefit reductions; rather, it proposes that any future tax increases or benefit reductions be structured in a way that automatically responds to changes in Social Security's financing over time.

Reformers sometimes refer to restoring Social Security to "permanent solvency," which expresses the goal that Social Security be solvent not only though 75 years but beyond. However, the phrase "permanent solvency" does not account for the fact that future economic and demographic conditions are far from certain: even under policies that would be expected to produce permanent solvency based on the Trustees intermediate assumptions, a wide range of outcomes is possible. Through new self-adjusting approaches to program financing the prospect of permanent solvency is significantly easier to achieve.

A self-adjusting approach is not simply superior as long-run policymaking. It may also assist on the political front, encouraging more timely enactment of reform by addressing uncertainties regarding the size of the future Social Security shortfall. Should Social Security's shortfall turn out to be less than projected, as some claim it will, then the tax increases or benefit reductions applied will be smaller as well. Should the shortfall prove larger than projected, additional tax increases or benefit reductions will automatically be applied. This does not imply that policymakers cannot or should not actively alter these options over time. However, it does mean that future policy changes will be made from the standpoint of a solvent Social Security program, which allows for better and timelier decisions.

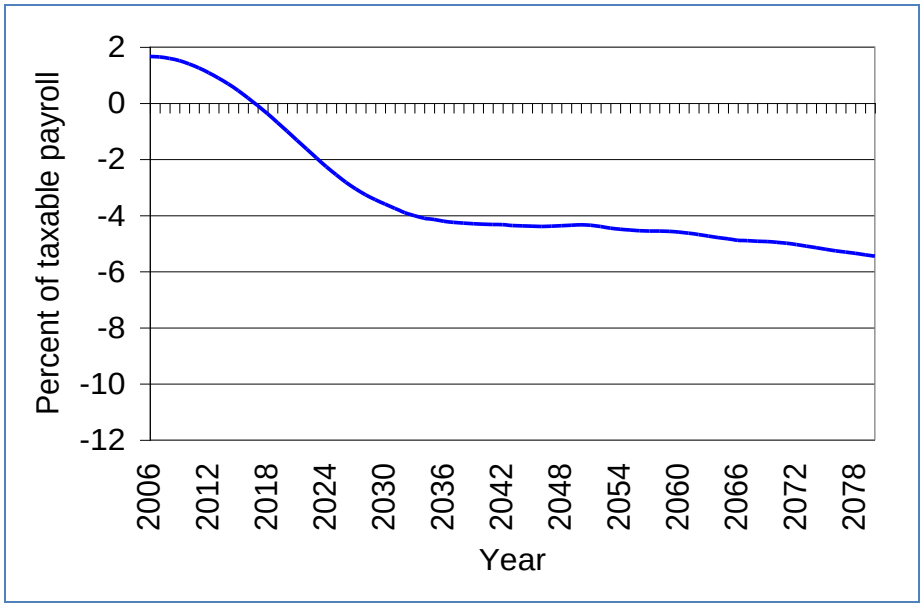
For simplicity of presentation, the discussion below will focus on forecasts made by the Social Security Trustees and policies that would promote solvency under the Trustees projections. However, the Congressional Budget Office's treatment of uncertainty is qualitatively similar to that of the Trustees and thus the discussion below should be applicable to reforms undertaken under the CBO baseline.

Uncertainty in Social Security's Finances

Figure 1 illustrates Social Security's net cash flow – meaning tax income minus benefit outlays, as a percentage of the taxable wage base – on an annual basis from 2006 through 2080 under the intermediate cost projections from the 2006 Social Security Trustees Report. The program is currently running a surplus of slightly less than 2 percent of payroll but begins running deficits in the year 2017. These deficits increase

over time such that by the year 2080 they are close to 6 percent of payroll. In the latest Trustees Report, Social Security's projected finances have improved, from a 75-year shortfall of 1.92 percent of payroll in 2006 to 1.70 percent of payroll in the 2008 Trustees Report, but the qualitative picture remains very similar.

Figure 1: Social Security Net Cash Flow



It is this intermediate cost projection to which almost all reformers address their policies. To make the system sustainably solvent, a goal supported by reformers of both political parties since the 1980s, in practice requires that Social Security's long-term income and cost be equalized such that net cash flow roughly equals zero.[1]

Despite heavy reliance on the intermediate projection, the Trustees and actuaries have always acknowledged uncertainty regarding their forecasts. Until 2003, this was done solely by comparing the intermediate projection to "Low Cost" and "High Cost" scenarios for future financing. For each relevant economic or demographic

variable, high, low and intermediate values were chosen. Combining the intermediate values produces the Social Security Agency (SSA) actuaries intermediate cost scenario. To show uncertainty, the Low Cost scenario is constructed using the low cost values for each variable, and the High Cost scenario constructed using the high cost values for each variable.

While the Low and High Cost scenarios help convey a sense of uncertainty, they are flawed in two important ways. First, no probability is attached to the low or high cost values of each individual variable. While it is assumed that the intermediate cost value for a given variable is the median value, lying at the 50^{th} percentile of a distribution, there is no likelihood assigned to the low and high cost values.

For instance, the intermediate value for future real wage growth in the 2006 Trustees Report was 1.1 percent above inflation, while the low and high cost values were 1.6 percent and 0.6 percent respectively. But are these low/high cost values assumed to have probabilities of 10 percent each? 5 percent? 1 percent? It is impossible to know, since they are simply not specified.

Second, the Low/High Cost scenarios are constructed using the low/high cost values of each demographic or economic variable, without consideration of how likely it is that these values would occur simultaneously. Put more precisely, the covariations between different variables, particularly over the long-term, are not fully considered. The Low Cost scenario, for instance, assumes favorable outcomes for real wage growth, inflation, interest rates, fertility, mortality, immigration, and disability onset and recovery, yet there is no macroeconomic consideration of whether it is likely or even

possible for this to occur. For instance, we might think that higher fertility and higher immigration are substitutes, such that one will tend to occur in the absence of the other. The Low Cost scenario, however, assumes that both occur simultaneously. Likewise, increased growth of the labor force, either through higher fertility or higher immigration, might be associated with lower wages, but the Low Cost scenario assumes that higher labor force growth occurs alongside higher wage growth.

Since 2003, the Social Security's Trustees treatment of uncertainty has been improved considerably, with the inclusion of a stochastic (or "Monte Carlo") simulation in which the probabilities of outcomes at the variable level are made explicit and at least some modeling of the covariations between different variables is undertaken. The SSA actuaries' model derives from the CBO stochastic model, which was introduced in 2001.[2] For this analysis I will focus on the SSA model, though structurally the two are quite similar.

In the stochastic model, the Trustees' intermediate cost assumption for each variable is assumed to be the mean or average value. The intermediate projection is based on the judgment of the Trustees and actuaries, informed by past experience, theory and expectations regarding the future. To this mean value is assigned a standard deviation of annual values, which is derived from the standard deviation of historical values for each variable.[3] Thus, the Trustees may project that the average value for a given variable may differ in the future from its past value, but the volatility of future values is generally derived from past behavior.

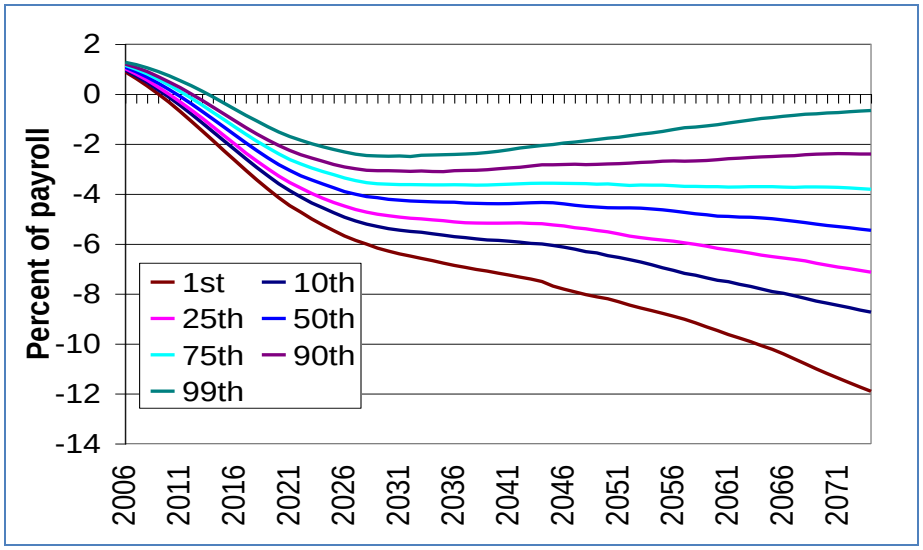
Using a random number generator, it is possible to generate countless simulated outcomes for each variable. The stochastic model generates random values of each variable for each year, calculates income and revenue for that year, then repeats the process until full system financing over 75 years is generated. This process of creating individual scenarios is then repeated 5,000 or more times to produce a full distribution of outcomes. No single simulation has much meaning by itself, but combined with others it can convey a picture of the uncertainty regarding projections of future outcomes for Social Security.

I have replicated the SSA calculations using the Social Security and Accounts Simulation (SSASIM) model of Social Security financing developed by the Policy Simulation Group. The SSASIM model's development began in the mid-1990s under the aegis of the 1994-1996 Advisory Council on Social Security, and it has been capable of conducting stochastic simulations from the outset.[4] The CBO model was developed based on insights from SSASIM, and the SSA model derived from CBO, so that all these models share similar lineage.

Figure 2 details stochastic output from the SSASIM model. The mean values and standard deviations are very similar to those used in the SSA actuaries' model, and the results themselves are quite similar.[5] It is worth noting that, as in figures produced in the Trustees Report, the cash flow lines at each percentile of the distribution are constructed based on the annual values for each simulation. That is, the line for the 90th percentile, for instance, is based on the annual values at the 90th percentile for each year of the simulation; there is no single simulation that replicates the actual cash flow

from year-to-year as shown for the 90th percentile. The distribution of cash flows from specific simulations tends to be narrower than displayed in these figures.

Figure 2: Stochastic simulation of Social Security cash flows, SSASIM model



As can be seen, cash flows at the 50th percentile correspond closely to those in the Intermediate Cost projections. Moreover, even at the 99th percentile of outcomes the program remains in cash deficits from 2017 through the remainder of the 75 year period. However, there is considerable variation in outcomes within that range.

As a side note, the stochastic simulation allows us to consider the probabilities that the Low Cost or High Cost scenarios would come to pass under the Trustees Intermediate assumptions. According to the 2007 Trustees report, the 75-year actuarial balance under the Low Cost scenario is a surplus of 0.37 percent of payroll, while the balance under the High Cost scenario is a deficit of 5.05 percent of payroll. (The 2007 Intermediate Cost projection was for a deficit of 1.95 percent of payroll.) In a SSASIM run with 1,000 simulations, the actuarial balance was never above 0.37 percent or

below 5.05 percent. When the number of scenarios was increased to 10,000, the Low Cost scenario was achieved once while the High Cost scenario still never occurred. While overall uncertainty is probably greater than displayed in the stochastic projections, due to sources of uncertainty not currently modeled, this nevertheless shows that if one accepts the Trustees intermediate projections for individual variables the likelihood of the program remaining solvent over the long term without policy changes is exceedingly small.

There are a number of ways to quantify the uncertainty in a stochastic simulation. Here I've used a very simple one: measuring the distance between the 10th and 90th percentiles of net income in 2080. The median amount shown in figure 2 is around -5.5 percent of payroll, while the 10th percentile outcome is at -8.7 percent and the 90th percentile outcome is at -2.4 percent. The gap between the 10th and the 90th percentiles is thus around 6.3 percent of payroll. For the following exercises I will continue to use the gap between the 10th and 90th percentiles of cash flows in the 75th year as the measure of uncertainty in system financing.

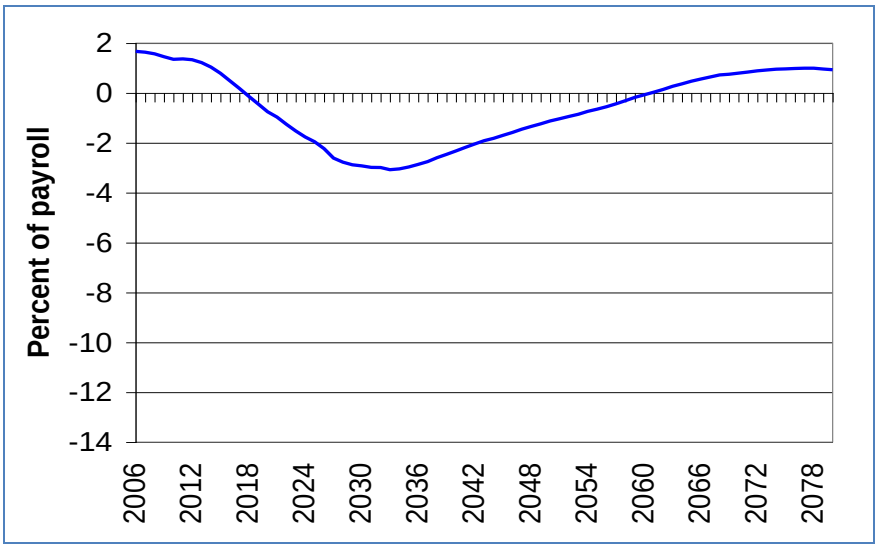
System financing uncertainty under price indexing

One of the most prominent reforms mentioned for Social Security is to shift the indexing of initial benefits from the growth of wages to the growth of prices.[6] Under current law, Social Security benefits are wage indexed. This implies that the ratio of initial benefits to pre-retirement earnings – the so-called replacement rate – will remain constant over time. As real wages are rising, initial Social Security benefits will rise

alongside them at approximately the same rate. Under wage indexing, average initial benefits for each new cohort of retirees will increase at the rate of real wage growth. Shifting to price indexing would imply that initial benefits would increase only with inflation and eliminate benefit increases resulting from real wage growth. Price indexing can be described as an inflation-adjusted freeze on average benefits. From cohort to cohort, benefits would remain approximately the same over time. As pre-retirement earnings would continue to rise, Social Security would decline relative to pre-retirement earnings each year, by approximately the rate of real wage growth.

Price indexing by itself could restore Social Security to sustainable solvency, as tax revenues would continue to rise in real terms while benefits rose only with inflation. Figure 3 illustrates net cash flows assuming that initial benefits are price indexed as of the year 2017 under the Trustees intermediate projection. The year 2017 is chosen as it is the first year in which the program is projected to begin running cash deficits. As can be seen, while cash flow would turn negative and remain so for approximately five decades, due to the overhang of benefits already accumulated and changing demographics, over time the program would be restored to positive cash flow and even to surpluses.

Figure 3: Net cash flows under price indexing

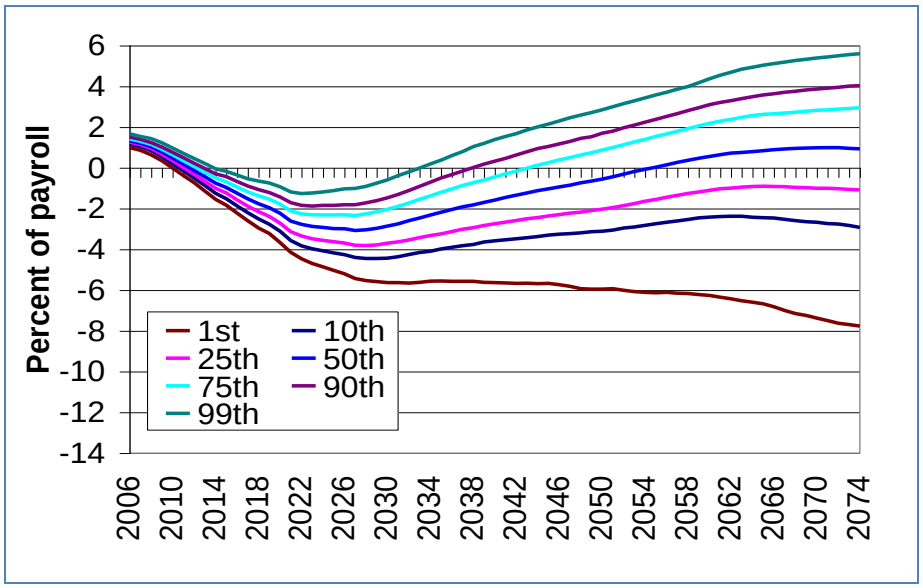


But how would price indexing affect uncertainty regarding system financing? Under current law future benefits are tied to wage growth, such that higher wage growth results in higher benefits and vice versa. While this implies higher overall benefits than under price indexing, it also produces a strong correlation between the system's resources – derived from taxes on wages – and the system's benefit obligations. While this is not enough to fully offset uncertainty in other variables, it moderates the uncertainty in system financing.

Price indexing would eliminate this link and thereby increase uncertainty regarding future Social Security solvency. Figure 4 utilizes the SSASIM model to illustrate the effect of price indexing on the uncertainty of system financing. As can be seen, the dispersion of outcomes increases significantly. Using the spread of cash flows in the 75th year as our measure of uncertainty, one can see that the distance between the 10th and 90th percentiles increases from 6.3 percent of payroll under the current benefit formula

to 7.0 percent of payroll under price indexing. There is no denying that price indexing makes the *median* outcome far more favorable, but price indexing also runs a significant probability of *overbalancing* the program. While it is better to be over- than underbalanced, an overbalanced program implies that earlier cohorts were subjected to larger benefit reductions than was necessary to restore solvency, which in turn reduces their consumption and harms their retirement security.

Figure 4: Stochastic simulation of cash flows under price indexing, SSASIM model



In following sections, I will develop an approach designed to produce the same improvements in system financing as price indexing – that is, equalizing cash flows to restore the program to sustainable solvency – but in ways that reduce the uncertainty regarding future outcomes.

Deriving the annual cost rate

Before introducing new policies, it is necessary to first explain how annual Social Security benefit costs are derived. Doing so introduces the main variables at work and shows how indexing to changes in these variables can reduce uncertainty in future Social Security financing.

The annual cost of paying Social Security benefits relative to the wage base, referred to as the "cost rate," can be expressed as

$$C_t = \frac{B_t / E_t}{W_t / R_t}$$

where C_t = cost rate; B_t = average benefit; E_t = average taxable earnings; W_t = number of workers; and R_t = number of beneficiaries; all expressed as of time *t.*

Put simply, the annual cost rate is equal to the average benefit as a percentage of the average wage – which is one way of describing the "replacement rate" provided by the program – divided by the worker-retiree ratio. For instance, consider the following example, based on 2005 figures.

$$C_{2005} = \frac{\frac{\$10{,}810}{\$30{,}012}}{\frac{161 million}{49 million}} = \frac{36\%}{3.3} = 11\%$$

Intuitively, if the average retiree's benefit is equal to 36% of the average wage and there are 3.3 workers supporting each retiree, each worker needs to put aside 36/3.3 of his earnings – 11% – to do so. As it turns out, the 2005 cost rate was 11.13, so this formula works well for these purposes.[7]

The cost rate is determined by a number of economic and demographic factors:

- Labor force growth: fertility and immigration largely determine the growth of workers paying taxes into the program;
- Mortality and disability incidence: life expectancies and the number of disabled workers affect the number of beneficiaries collecting from the program;
- Wage growth: changes in earnings affect the ratio of the average benefit to the average wage, although the indexing of future benefits to wage growth limits the effect of this factor over time. If wage growth increases, the ratio of the average benefit to the average wage will decline for a time, and then stabilize at a new lower level once benefits are indexed.

Benefits in a given year are driven by longer-term factors, such as career-long wage growth and changes in household structures. For that reason, changes in other factors will drive shorter-term variations in the annual cost rate. If wages rise, then benefits fall relative to the average wage, reducing the cost rate. If there are more workers or fewer retirees, then the cost rate also falls.

If the ratio of workers to beneficiaries declines from 3.3-to-1 to 2-to-1, as is anticipated by around the year 2040, the cost of providing benefits rises from around 11 percent of payroll to around 18 percent of payroll.[8]

Indexing taxes and benefits to the worker-beneficiary ratio

The crucial element driving the cost rate shown above is the ratio of workers to beneficiaries. If this ratio remained stable at the current level of around 3.3 workers per beneficiary, the program could be expected to remain solvent indefinitely. While we cannot control the worker-beneficiary ratio, we can index taxes or benefits to changes in the ratio. Indexing taxes or benefits to the dependency ratio (workers/retirees) will address the central cause of insolvency. As the worker-beneficiary ratio declines, taxes

would automatically be increased or benefits automatically reduced. While it would not be possible to prevent Social Security from running deficits at all, given the sudden on-rush of Baby Boom retirements and the accumulated benefit obligations owed to the Baby Boomers, indexing taxes or benefits to the worker-beneficiary ratio would return Social Security to solvency over the long term.

Indexing to the worker-beneficiary ratio will also reduce uncertainty due to unanticipated changes in fertility or mortality. The Social Security Trustees project the worker-beneficiary ratio in 2040 will be around 2-to-1, but in fact it could be higher or lower than anticipated. If we index either taxes or benefits to the worker-beneficiary ratio, we can be more confident the program will be solvent in the future.

Indexing benefits to the worker-beneficiary ratio would work in the following manner, which qualitatively follows Furman (2007). B_{It} is the indexed benefit at time *t*; it is equal to the scheduled benefit at time *t* multiplied by an indexing factor equal to the worker-beneficiary ratio at time *t* divided by the worker-retiree ratio in a base year. If the worker-retiree ratio is declining, then the indexing factor will be less than 1 and the indexed benefit will be lower than the scheduled benefit.

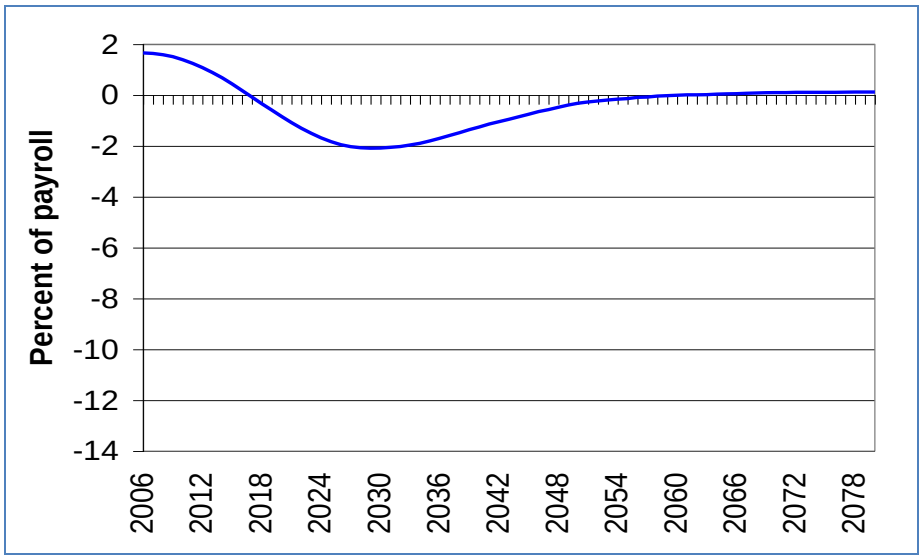
$$B_{It} = B_{CLt} * \left(\frac{D_t}{D_b} \right)$$

For example, assume that indexing begins in 2012, when dependency ratio equals 3.06. A medium wage worker retires in 2055, and is entitled under the current benefit schedule to an annual benefit of $22,304 in today's dollars. The projected dependency ratio is 1.99 workers per beneficiary. Assuming that the projection turned

out to be the *actual* ratio, the indexing factor equals (1.99/3.06) = 0.70. Multiplied by the current law scheduled benefit, this produces an indexed annual benefit of $15,587.

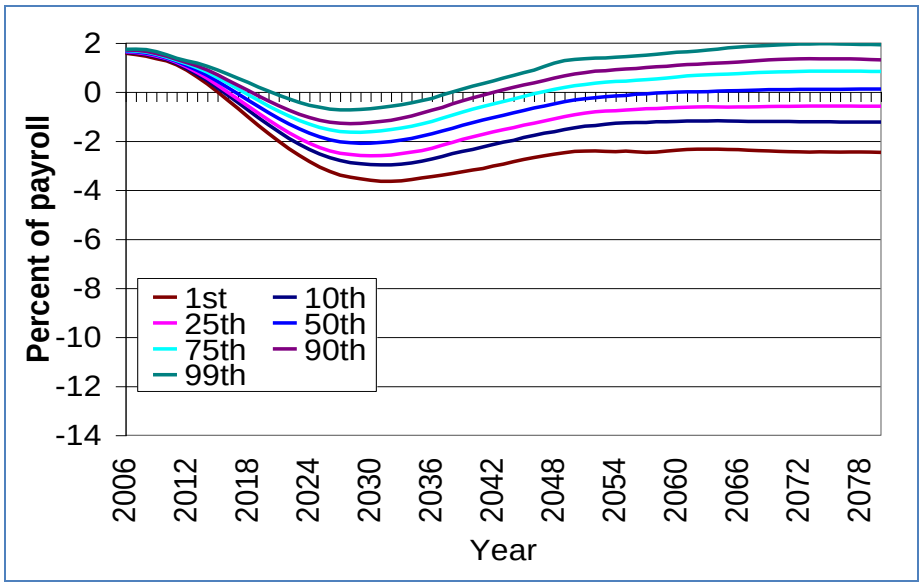
Figure 5 illustrates how dependency indexing of initial benefits would alter Social Security cash flows.[9] As with price indexing, it is assumed that the policy change is implemented beginning in 2017. The overall effect on cash flows is similar to price indexing of benefits, with the exception that under dependency indexing benefits are reduced more quickly in the near term but stabilized in the long term.

Figure 5: Indexing initial benefits to worker-beneficiary ratio, beginning 2017



The more important implications of indexing benefits to the worker-beneficiary ratio are shown in Figure 6, which utilizes the SSASIM stochastic model to simulate the distribution of outcomes. It is clear that the range of uncertainty is far smaller than under current law or under price indexing. The distance between the 10th and 90th percentiles of cash flows in the 75th year declines from 6.3 percent of payroll under current law and 7.0 percent under price indexing to only 2.5 percent.

Figure 6: Stochastic simulation of cash flows under dependency indexing of benefits, SSASIM model



The remaining uncertainty in Figure 6 is largely due to variation in real wage growth, which can alter the ratio of average Social Security benefits to average wages and thus change the cost rate. Furman points out that this could be addressed by indexing post-retirement benefits to changes in real wage growth. In this way, practically all major uncertainty would be removed from long-term Social Security financing. A variant on this that might be attractive on alternate grounds would be provide annual Cost of Living Adjustments (COLA) to benefits equal to growth in wages rather than inflation. Doing so would index post-retirement benefits to wages and thus reduce uncertainty. It would also tend to increase benefits over retirement; this could be desirable on policy grounds as the real level of non-Social Security retirement income often declines through retirement. To maintain overall system financing accounting for interest costs and mortality, the initial benefit would need to be reduced by around 15 percent, but doing so might encourage individuals to work longer.

The alternative to indexing benefits to the worker-beneficiary ratio is to index the Social Security payroll tax rate.[10] The mechanics of doing so would be very similar. Indexed taxes at time *t* would equal current law taxes – 12.4 percent of earnings up to the taxable maximum – multiplied by an indexing factor equal to the worker-beneficiary ratio at a base year divided by the worker-beneficiary ratio in year *t*.

$$T_{It} = T_{CLt} * \left(\frac{D_b}{D_t} \right)$$

If the worker-beneficiary ratio declines from the base year, the indexing factor would be greater than one and the payroll tax would increase.

Figure 7 illustrates the effects of payroll tax indexing on the intermediate cost projections from the Social Security Trustees. While the program would still run deficits beginning in around 10 years, these cash shortfalls would be extremely modest and the program would be restored to sustainable solvency over the long run, albeit at the cost of significant increases in the payroll tax rates. Tax indexing can have a more immediate effect than benefit indexing, because benefit indexing would alter only initial, or newly realized, benefits, not the benefits for individuals already retired. Tax indexing would immediately increase taxes on all workers participating in the Social Security program.

Figure 7: Indexing payroll tax rate to worker-beneficiary ratio, beginning 2017

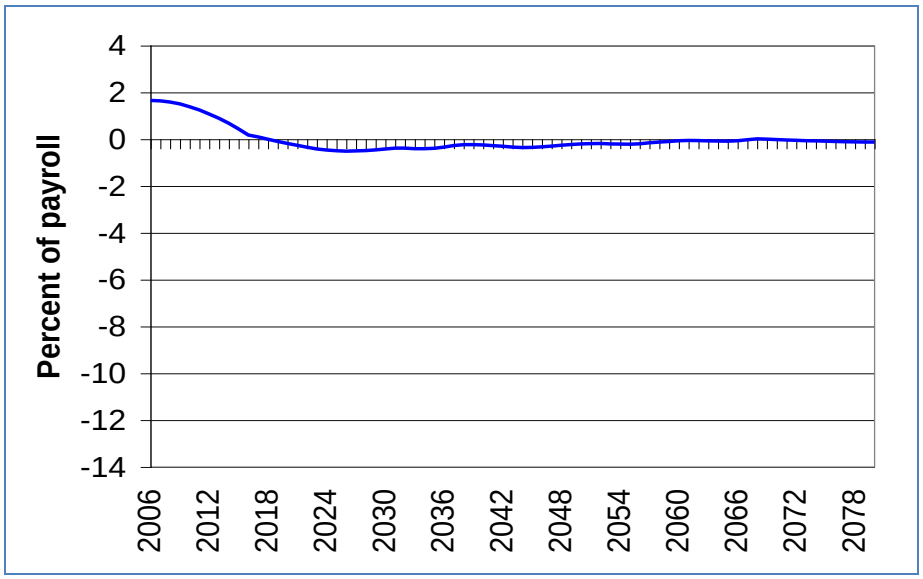
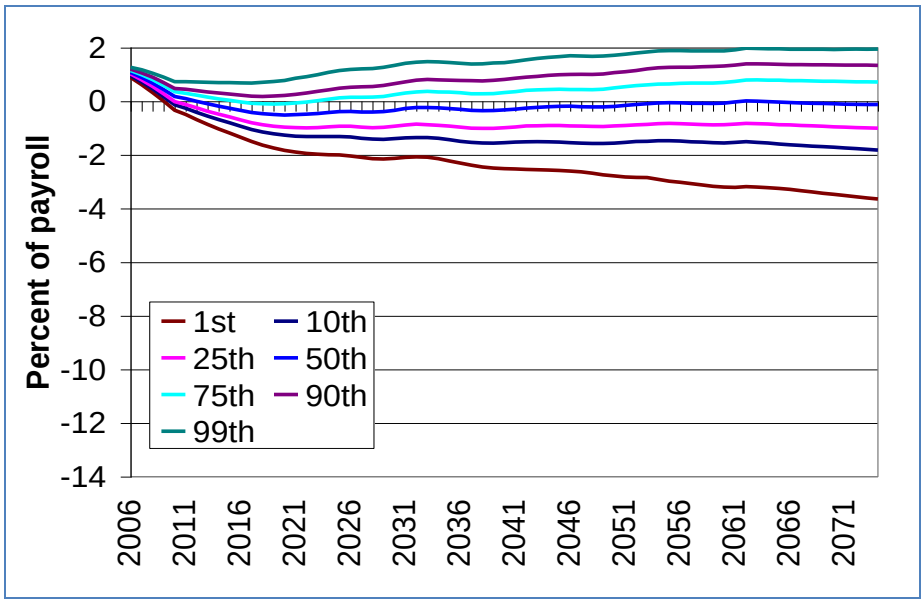


Figure 8 illustrates the range of outcomes that could be expected if the payroll tax rate were indexed to changes in the worker-beneficiary ratio beginning in the year 2017. Interestingly, while the median outcome for tax indexing appears better targeted than indexing of initial benefits, the range of outcomes – while still significantly narrower than under current law – is broader than for indexing initial benefits. The gap between the 10th and 90th percentiles of cash flow in the 75th year is 3.8 percent of payroll, versus 2.5 percent for indexing of initial benefits.

Figure 8: Stochastic simulation of cash flows under dependency indexing of payroll tax rates, SSASIM model



Discussion

Policymakers need to pay greater attention to how potential reforms would affect the uncertainty of future Social Security financing. It is also important that government agencies provide policymakers with improved information regarding variability in system financing. Currently, the Social Security actuaries do not conduct stochastic simulations of reform options, although CBO does so. This is an important omission on the part of the Social Security Administration and should be rectified if it wishes to maintain its historical role in policy development.

Indexing taxes or benefits to the worker-beneficiary ratio has several important advantages. First, it significantly reduces uncertainty regarding Social Security's future financing. This uncertainty imposes costs on both policymakers and participants in the Social Security program. Second, the declining worker-beneficiary ratio is one of the

most understandable parts of Social Security system financing. Gearing reform options toward this ratio may make a reform package more easily understood, and potentially more easily accepted, by the public.

Third, these indexing methods apply changes only as needed – if intermediate projections prove pessimistic, policy changes will be smaller. Aside from the policy advantage of smoothing cost burdens more evenly over time, this approach has important political advantages. A significant obstacle to reform has been the belief that Social Security's shortfalls are largely the result of pessimistic projections by the program's Trustees, such that the true shortfall will turn out to be far smaller than projected. While this may not be likely, the stochastic simulations shown above show that such outcomes cannot be ruled out. Automatic indexing bypasses these objections to moving quickly ahead with reform. The political process must decide the proportionate roles of tax increases and benefit reductions in achieving solvency, but the actual size of these policy changes would be dictated as Social Security's financing outcomes evolved over time.

That said, it should be stressed that the policies explored here are used purely to illustrate the power of automatic indexing, not to advocate either approach or the two in combination as the best means to reform Social Security. Relying purely on tax rate increases or reductions in initial benefits is crude and ignores many important facets of the Social Security program and its projected funding shortfalls. Social Security has numerous shortcomings in addition to its funding shortfalls, such as its treatment of different household types and its incentives to work and retire, and thus a more

comprehensive reform of the program's structure is desirable. Moreover, many analysts favor the introduction of a savings component, either funded out of existing payroll taxes or from additional revenues or contributions; this important aspect of reform is not discussed here. Thus, the analysis above should not be taken as advocacy for a given reform but rather for a broad class of reforms that automatically adjust as conditions change.

In addition to indexing taxes and/or benefits to the worker-beneficiary ratio, the early or normal retirement ages may be indexed to changes in life expectancy. In the abstract, an individual would react to a longer life span by saving more while working, consuming less while retired, and working longer. Introducing automatic indexing of the retirement ages could incorporate this important factor as well.

Now, it may be objected that there is no reason to pre-select changes to Social Security taxes and benefits many decades in the future. It is true that future Americans may desire a different Social Security structure and a different mix of taxes and benefits than those that would be determined at the time of reform. However, there is no reason future policy changes need be made only under the threat of insolvency. The advantage of automatic indexing is that it would maintain Social Security on a solvent basis and thus allow future Americans to more easily adapt the Social Security program to their preferences. In the past, Social Security has been altered only when it became underfunded, and at those times reforms are both difficult to enact and less likely to address important non-financing issues. By putting Social Security on a stable financial

footing under a broad range of economic and demographic conditions, automatic indexing can allow future Americans more choices, not fewer.

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[1] Technically, sustainable solvency is defined as Social Security's trust fund remaining solvent through 75 years and the ratio of trust fund balances to annual outlays – the so-called trust fund ratio – being stable or rising at the end of the period. In practice, sustainable solvency at the trust fund level is difficult to achieve without bringing cash flows into balance. As my analysis and policies here center on cash flows, I will use cash flow balance as a de facto measure of sustainable solvency even if the technical definition differs somewhat.

[2] See CBO (2001).

[3] For more details on the construction of the SSA stochastic model, see Cheng (2004)

[4] More detail on the SSASIM model is available at www.polsim.com

[5] SSASIM reports a median actuarial balance of -2.14% of payroll, versus a median value from the 2007 Trustees Report -2.05%. The 80% confidence interval SSASIM is from -1.16% to -3.24%, a range of 2.08% of payroll, versus from -1.04% to -3.24% in the 2006 Trustees Report, a range of 2.20% of payroll. The 95% confidence interval range in SSASIM is 3.30% of payroll, versus a range of 3.33% of payroll in the 2007 Trustees Report.

[6] For instance, one reform model proposed by President Bush's 2001 Commission to Strengthen Social Security relation upon shifting from wage- to price-indexing of initial benefits.

[7] Note that the average wage shown here isn't the Average Wage Index reported in the Social Security Trustees Report. The AWI includes all earnings, including above the cap and non-covered earnings. Au, Mitchell and Phillips report that the AWI exceeds the true median wage by around 18%, so for an approximation the figure here is simply the AWI minus 18%.

[8] Other factors, principally the scheduled increase in the normal retirement age, which will reduce future retirement benefits, will lower the future cost rate, but that is not directly relevant here.

[9] In simulating the proposals, it was necessary to modify the parameters somewhat due to model limitations. The SSASIM model does not directly track the numbers of workers and beneficiaries, so as an alternative benefits and taxes were indexed to changes in the ratio of the working age population (age 21-64) to the population 65 and over. As this declines more quickly than the worker-beneficiary ratio, an adjustment factor is inserted to reduce the effects of the indexing. In practice, a policy indexed to the worker-beneficiary ratio should show somewhat better results in reducing uncertainty than the simulations shown here.

[10] It is also possible to index the maximum taxable wage to the worker-beneficiary ratio, although I have not modeled it here.