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ABSTRACT

A funded social security retirement program would imply a larger capital stock and a higher level of real income than an unfunded program that provides the same level of benefits. The transition from an unfunded program to a funded program that does not reduce the benefits of existing retirees or the present value of the benefit entitlements of existing employees would, however, require substituting explicit government debt for the equally large implicit debt of the unfunded program.

This paper shows that such a debt financed transition from an unfunded program to a funded program is not just a change of form without economic effects. Such a debt financed transition would raise economic welfare if three conditions are met: (1) the marginal product of capital exceeds the rate of economic growth; (2) the capital intensity of the economy is below the welfare maximizing level (i.e., the marginal product of capital exceeds the appropriate consumption discount rate); and (3) the rate of economic growth is positive.

Illustrative calculations based on U.S. experience since 1960 suggest that the present value of the gain from a debt financed transition to a funded program would substantially exceed the current level of GDP. More explicitly, even with a relatively high real consumption discount rate of 4.4 percent, the present value gain would be about 1.5 dollars per dollar of current net social security wealth or about $17 trillion.

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Would Privatizing Social Security Raise Economic Welfare?

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Social security retirement programs around the world generally rely on an unfunded "pay as you go" financing system in which the payroll taxes of current employees are used to finance transfers to current retirees.[1] Despite the absence of a capital fund, participants in such pay-as-you-go systems receive a positive rate of return equal to the rate of growth of aggregate social security taxes (Samuelson, 1958). Although this rate of return is limited in the long run to the rate of growth of wage income, participants during the early decades of a pay-as-you-go system can receive substantially higher rates of return because of increases in the payroll tax rate itself. In the United States, the combined employer-employee payroll tax for social security retirement benefits rose from 2 percent in the late 1930s to 12 percent in the 1980s, permitting early participants to enjoy double digit real rates of return.

Looking ahead, however, the steady state rate of return on social security taxes in mature unfunded programs will be very much less than the return available on additional real saving and investment. The demographic shift to an older age distribution during the next several decades will make the actual difference in rates of return even larger in most countries. Current

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[1]There are a few notable exceptions to this pay as you go financing. Singapore and Chile now have funded programs while Argentina, Mexico and Hong Kong have announced plans to create funded programs.

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employees in unfunded programs will on average receive negative real rates of return on their social security taxes unless future social security payroll tax rates are increased substantially in line with the rise in the ratio of retirees to employees.

These conditions have generated widespread interest in the possibility of shifting social security retirement from pay-as-you-go systems to funded programs. The essential feature of such a shift is to eliminate the unfunded program by giving government bonds to current retirees and employees with a value equal to the present actuarial value of the benefits to which they are currently entitled.[2] In the future, employees (or their employers) are then required to contribute to a funded program. Although this could be a fund managed by the government itself, the countries that consider funded programs have proposed that the funds be invested privately, subject only to government regulation and supervision.[3] This paper will therefore refer to the shift from an unfunded pay-as-you-go program to a funded program as "privatizing" social

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[2]This is complicated in the case of current employees because retirement benefits are frequently defined in terms of years of employment in a way that gives relatively high weight to earnings late in life. This gives a value to continued plan participation in addition to the value of currently accrued benefits.

[3]The current plans for funded social security programs in Argentina, Bolivia, Brazil, Hong Kong and Mexico all contemplate the use of private fund managers. Chile has already adopted such a system. The partial privatization in the U.K. also uses existing private managers.

Private fund managers relieve the government of the role of picking individual companies or investment programs in which to invest and may lead to greater product innovation in asset mixes and participant services. Such decentralization of administration may also have higher administrative costs. Diamond and Valdez-Prieto (1994) documents substantial administrative costs in Chile but this may be due to restrictions that prevent exploiting economies of scale in fund management.

security.[4]

Surprisingly, there has been no explicit analysis of the conditions under which privatizing social security would increase economic welfare.[5] The potential ambiguity of the effect occurs because, while each future generation would benefit from earning the higher return on real

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[4] Although the United States currently collects more in social security payroll taxes than it pays in benefits, this is not part of a transition to a funded system but is the result of a decision in 1983 to try to stabilize the tax rate over a 75 year period by temporarily accumulating a fund and then running it down. Unfavorable experience since 1983 has led to a series of revisions in the date at which the tax rate will have to increase. The most recent projections indicate that the current tax rate will be insufficient to fund concurrent benefits in the year 2015 and that the social security trust fund would be exhausted in approximately 2030.

The effect of even this temporary fund accumulation on national saving is uncertain. The current Congressional discussions about balancing the federal government budget by 2004 or sooner use the social security surplus to achieve this balance. If the same budget goal would have been set in the absence of the social security surplus, the existence of the surplus implies no increase in national saving.

[5]Samuelson (1958) showed that the introduction of a pay-as-you-go program would raise the welfare of every generation in an economy in which there can be no capital stock (because all goods are perishable) and therefore no opportunity to earn a return greater than the rate of increase of the tax base. Aaron (1966) noted that a dynamically inefficient economy that is producing with a capital intensity greater than the golden rule level (i.e., the marginal product of capital is less than the rate of aggregate economic growth) could also raise economic welfare by introducing an unfunded social security program because doing so would reduce the initial excessive level of the capital stock. But in the empirically relevant case in which the marginal product of capital exceeds the growth rate, the substitution of an unfunded social security program for capital accumulation can reduce economic welfare. Feldstein (1985) derived the optimal level of benefits in an unfunded system and showed conditions under which that optimum would be zero. Feldstein (1995) states the potential loss in present value consumption from introducing an unfunded program but does not discuss the consequences of switching from an unfunded to a funded system. Auerbach and Kotlikoff (1987, Chapter 11) and by Seidman (1983, 1986) have discussed the effects of reducing the benefits of existing retirees but not of privatizing the existing system with benefits unchanged. Auerbach and Kotlikoff (1987) and Corsetti and Schmidt-Hebbel (1995) show that shifting to a funded system would substantially raise welfare by reducing the distortions to labor supply caused by existing payroll taxes; that mechanism of increasing welfare is not considered in the present paper since that distortion could largely be eliminated without shifting to a funded system.

investments instead of getting a return equal to the rate of increase of the payroll tax base, these future generations would also be obligated to pay taxes to finance the interest on the extra national debt created in the process of privatization.[6] The question of whether privatizing social security raises economic welfare is therefore equivalent to asking whether the burden of financing the extra debt is less than the gain from the higher rate of return on the incremental real saving.

Before looking at the welfare effect of privatizing an existing unfunded social security system, it is useful to examine the conditions under which the introduction of an unfunded social security system reduces the present value of economic welfare. The analysis that follows shows that those conditions are not the same as the ones that cause privatizing an existing unfunded program to raise economic welfare but that the two sets of conditions are closely related. Analyzing the effects of introducing an unfunded program provides the natural framework for evaluating the consequences of privatizing an existing system.

Each generation of employees that is required to participate in an unfunded program incurs a loss that reflects the difference between the marginal product of capital and the rate of growth of the economy. A necessary condition for the introduction of an unfunded system to create a welfare loss is that the economy's capital intensity is less than the golden rule level, i.e., that the marginal product of capital exceeds the rate of growth. However, the present value of the losses that result under that condition must be balanced against the transfer to the initial

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[6]More fundamentally, future generations would lose the income generated by the capital stock that is crowded out by the creation of the new debt. This is equivalent to the interest on the national debt when the rate of interest paid by the government is equal to the marginal product of capital in the private economy. These issues are treated more explicitly in the text below.

generation of retirees who receive retirement benefits when the unfunded system is created without having made any contributions. The analysis of section 1 shows that the present value of the losses to future generations exceeds the value of the initial transfer if the marginal product of capital exceeds the rate at which the consumption of future generations is discounted, a more stringent condition than the dynamic efficiency requirement that the marginal product of capital exceeds the rate of economic growth. These are in fact only necessary conditions for the introduction of an unfunded program to reduce economic welfare. Whether it does so depends on the extent to which there are "myopic" individuals who would, in the absence of a mandatory program, not provide adequately for their old age.

Section 2 uses the framework of section 1 to derive the conditions under which privatizing an existing social security program would raise economic welfare even though it requires increasing the national debt by the amount of the existing unfunded social security benefits. Although this might appear to be nothing but a substitution of explicit debt for implicit debt, the analysis shows that debt financed privatizing of social security can raise economic welfare under economic conditions that are likely to prevail. In particular, the plausible conditions that the marginal product of capital exceeds both the rate of economic growth and the intertemporal consumption discount rate and that the growth rate is positive are jointly sufficient to imply that a debt-financed shift to an unfunded system raises economic welfare. The extent to which there are myopic individuals who would underprovide for their old age is not relevant since the mandatory funded program would provide them with at last as much retirement income as the unfunded social security program.

Section 3 discusses the values of the key parameters and uses those values to suggest

some plausible magnitudes of the gains from privatizing the existing unfunded U.S. social security program. There is a brief concluding section that discusses the problem of privatization in a democracy and points to the possibility of a path of Pareto improving changes in social security that leads to complete privatization.

1. The Welfare Loss of Introducing an Unfunded Social Security Program

Consider a simple overlapping generations model in which individuals live for 2 periods, earning w_t in the first period and saving s_t. If the marginal product of capital is ρ, the individuals consume $s_t(1+\rho)$ in retirement.[7]

Now introduce an unfunded social security program at time t=0 financed by a payroll tax at rate θ. The proceeds of the tax are paid to the current retirees. In the next period, the population has increased by a factor of $1 + n$ and the common wage rate by a factor of $1 + g$. The taxes collected in that next period are therefore $\theta w_0(1+n)(1+g) = \theta w_0(1+\gamma)$ where w_0 is the wage when the social security program is introduced. The members of the initial generation of employees thus receive $1 + \gamma$ dollars of benefits in retirement for every dollar of tax that they paid while working.

If the requirement to pay a social security payroll tax induces individuals to reduce their saving by an equal amount,[8] the loss of income in retirement is $(\rho - \gamma)\,\theta\, w_0$. The present value of

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[7]The role of taxes on capital income and the uncertainty of the return are discussed in section 3.

[8]Because the program reduces the present value of lifetime income, it would be expected to cause a fall in first period consumption and therefore a less than one-for-one displacement of private saving by the social security tax. This effect reduces the magnitude of the loss from

this loss to the individual at the time that the social security program is introduced is $(1 + \rho)^{-1} (\rho - \gamma) \theta w_0$.

If the number of employees is initially N_0, the loss to future generation t when the wage rate is $w_0 (1+g)^t$ and the labor force is $N_0 (1+n)^t$ is $(1 + \rho)^{-1} (\rho - \gamma) \theta w_0 (1+g)^t N_0 (1+n)^t = (1 + \rho)^{-1} (\rho - \gamma) \theta w_0 N_0 (1+\gamma)^t = (1 + \rho)^{-1} (\rho - \gamma) T_0 (1+\gamma)^t$ where T_0 is the initial aggregate payroll tax and therefore the initial transfer to the first generation of retirees. If the appropriate rate for discounting consumption of future generations is δ, [9]the present value of the loss to employee participants of all generations is:

$$(1) \qquad PVL = (1 + \rho)^{-1} (\rho - \gamma) T_0 \sum_0 [(1+\gamma)^t/(1+\delta)^t]$$

$$= [(1 + \delta)/(1 + \rho)] [(\rho-\gamma)/(\delta-\gamma)] T_0 .$$

Note first that if the economy is at the golden rule level of capital intensity (i.e., that $\rho = \gamma$), there is no loss to any generation of employees. The transfer to the initial retirees is a clear Pareto improvement.

In reality, of course, $\rho > \gamma$ and each generation of employees incurs a loss.[10] Note

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introducing an unfunded program. I return below to the possibility that individuals might reduce their non-mandatory saving in response to privatizing social security.

[9]The appropriate rate for discounting consumption across generations is discussed in section 3.

[10]The relation of ρ and γ is discussed in section 3. See also Feldstein (1965) and Abel, Mankiw, Summers and Zeckhauser (1989).

however that if $\delta = \rho$, the loss to future retirees just balances the transfer to the initial retirees ($L = T_0$) regardless of the difference between ρ and γ. n this case, the present value of the loss to all future generations is exactly equal to the value of the transfer to the initial retirees. If however the intergenerational consumption discount rate is less than the marginal product of capital, the loss exceeds T and the introduction of an unfunded social security program reduces the present value of future incomes by more than the value of the transfer to the initial retirees T_0[11] .

The condition $\delta = \rho$ implies that the marginal rate of substitution between consumption in one generation and consumption in the next is equal to the marginal rate of transformation. Equivalently, the existing level of capital is optimal in the sense of maximizing the intergenerational social welfare function subject only to the constraint of the intergenerational production function. Equation 1 implies that if the economy is operating at this first best optimum level of capital intensity there is no loss from a small shift of consumption from future generations to the current generation. In the more relevant case in which tax rules or other distorting factors cause $\rho > \delta$, shifting a dollar from investment to current consumption reduces the present value of the total consumption stream. Such a shift from investment to current consumption is exactly what the introduction of an unfunded social security program does and why, if $\rho > \delta$, it causes the present value of consumption to fall.

Whether the introduction of an unfunded social security program does in fact reduce the present value of consumption depends also on the extent to which it provides benefits that raise the retirement consumption of retirees who would otherwise have saved "too little" for their own

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[11]Equation 1 implies PVL > T_0 if $\gamma > -1$ and $\rho > \delta$. . Since γ is the growth rate of aggregate real labor income, $\gamma > 0$.

retirement.[12] Such myopic behavior would be precluded by the assumption that $\theta w_t < s_t$, i.e., that each individual's social security payroll tax is less than the amount that the individual would otherwise save. But if some individuals would have saved less than the payroll tax, the evaluation must go beyond the present value calculation of equation 1 to reflect the utility gain from providing benefits to "myopic" retirees in each generation. When there are enough myopic individuals, the gain from helping them by even an unfunded social security program can outweigh the loss associated with giving a lower return to rational savers.[13]

Although the balancing of this gain to myopes against the loss to rational savers is important in deciding whether to introduce a mandatory retirement program and in setting the scale of benefits, it is not relevant for deciding between a funded and an unfunded program since myopes are protected at least as much under a funded program as under an unfunded program.[14]

2. The Welfare Gain from Privatizing Social Security

Privatizing social security requires recognizing the obligation to existing retirees and to others who have already paid payroll taxes under the pay-as-you-go system. A fair recognition

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[12]Feldstein (1985) analyzed the issue of "inadequate individual saving" by modeling the representative individual in a two-period OLG model as having a true lifetime utility function $u(c_1) + u(c_2)$ but acting while young to maximize $u(c_1) + \lambda\ u(c_2)$ with $\lambda < 1$ for "partial myopia" and $\lambda = 0$ for complete myopia.

[13]Feldstein (1985) derives the optimal level of social security benefits in an unfunded system by balancing the gains to myopes against the loss to those who would otherwise have saved optimally.

[14]If the mandatory saving level in the funded program is as large as the tax in the pay as you go program, retirement benefits are even higher in the funded program.

of these obligations involves explicit creation of additional national debt of equal value. Before analyzing the welfare effects of such a debt financed privatization, it is useful to consider two alternatives to debt creation: (1) abrogating the explicit promises to current retirees and others who have previously paid payroll taxes; and (2) requiring current and future employees to pay payroll taxes to finance the existing benefit obligations without accruing any claims on future benefits in exchange for these taxes.

In the OLG model, the first places the burden of privatization on current retirees and the second places the burden on current employees. In contrast, the debt financed privatization places much of the burden on those who are not yet in the labor force.

Since privatizing by abrogating existing pension promises means, in the terms of section 1, reducing the consumption of exiting retirees by T_0 while raising the consumption of all future retirees by $(\rho-\gamma)\ T_0\ (1+\gamma)^t$, it is clear that this would raise the present value of consumption if $\rho > \delta$.[15] However, privatizing in this way could lower welfare because the consumption of retirees would fall sharply, implying that the marginal utility of dollars to these retirees is substantially greater. The alternative of financing current benefit obligations by taxing current employees without giving any benefits in exchange is more difficult to analyze because existing employees might respond to the combination of the tax and mandatory savings by reducing other saving that they currently do. As a practical matter, however, the government can neither abrogate all of its promises to existing retirees or impose an extra tax on current employees to

[15]The present value of these annual consumption increases, discounting at δ, is $(\rho-\gamma)T_0 / (\delta-\gamma)$.

raise the welfare of all future generations.[16]

The relevant form of privatization is therefore the substitution of additional explicit national debt for the social security promises. Each future generation therefore bears a burden because of the additional national debt that must be balanced against the higher retirement income that results from substituting real saving for the pay-as-you-go program. Since a debt financed privatization of social security does not reduce the benefits of existing retirees, the welfare effect depends on the relative magnitude of the future retirement income gains and the future debt service requirements.

In the OLG model of section 1, the privatization process is equivalent to reducing the payroll tax on the initial generation of employees by T_0 and issuing national debt of T_0. If the initial generation of employees increases saving by the amount of the tax reduction, this incremental saving is just enough to absorb the additional national debt.[17] The debt service during each period in the future is ρT_0.[18]

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[16]In some countries with small benefit obligations (e.g., Mexico) it might be possible to use current taxes to finance the exiting obligations in the process of privatization. The analysis of this section implies that such tax financed privatization is desirable whenever debt financed privatization is and could also be desirable under more general conditions.

[17]Although the initial employees are required to save T_0 in the mandatory private saving fund, they may reduce (or increase) other saving in response to the income effect of the privatization. If capital income taxes distort the lifetime distribution of each individual's consumption, a change in saving induced by these income effects will have a first order effect on individual lifetime welfare. Taking this into account explicitly would not alter the condition under which privatizing an unfunded social security program raises the present value of consumption but would alter the magnitude of the gain.

[18]Although the government may pay a net interest rate that is less than the marginal product of capital, the fact that national debt absorbs the private saving (and thereby displaces an equal amount of investment) implies that the lost return is the marginal product of capital. I

Table 1 shows the first four periods of the sequence of income and saving under the existing unfunded plan and the alternative privatized funded plan. With the unfunded system, taxes and benefits are equal to each other in each period and increase at the rate of growth of aggregate wages (γ). With the privatized funded system, saving is by assumption the same as the employees would otherwise have paid in payroll taxes. Retirees continue to receive transfer funded benefits at t=0 only and then receive the income and principle from their private saving. In addition, the existence of the government debt reduces real income in each period by ρT_0.

Note that at t=0 there is no difference between the outlays and receipts of retirees and employees under the existing unfunded plan and under the alternative debt-financed funded plan. At t =1, the retirees receive $T_0(1+\rho)$, an improvement of $(\rho - \gamma)\ T_0$ in comparison to the unfunded system. But some combination of retirees and employees must also bear the cost of debt service ρT_0. The net effect of privatization on consumption at t=1 is therefore $-\gamma T_0$.

Table 1 shows that while the negative effect of debt service remains constant at $-\rho T_0$, the retiree's gain from shifting to a funded plan increases in proportion to the growing level of aggregate wages $(\rho-\gamma)\ (1+\gamma)^t$. The effect of privatization eventually shifts from negative to positive. Privatizing the system raises the present value of consumption if the discounted value of the increased retirement consumption $\left[\Sigma_1 (\rho-\gamma)T_0(1+\gamma)^{t-1}\ (1+\delta)^{-t}\right]$ exceeds the present value of the debt service $\left[\Sigma_1 \rho\ T_0(1+\delta)^{-t}\right]$. The present value gain from privatizing is:

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return in the next section to the relation between the marginal product of capital and the net of tax yields on private securities and government debt.

Table 1

Receipts and Payments of Overlapping Generations

	t = 0	t = 1	t=2	t = 3
Social Security Program and Participants				
Unfunded				
Retirees (benefits)	$+ T_0$	$+ T_0 (1+\gamma)$	$+ T_0(1+\gamma)^2$	$+ T_0(1+\gamma)^3$
Employees (taxes)	$- T_0$	$- T_0(1+\gamma)$	$- T_0(1+\gamma)^2$	$- T_0(1+\gamma)^3$
Net receipts	0	0	0	0
Privatized				
Retirees*	$+ T_0$	$+ T_0 (1+\rho)$	$+ T_0(1+\gamma)(1+\rho)$	$+ T_0(1+\gamma)^2 (1+\rho)$
Employees**	$- T_0$	$- T_0 (1+\gamma)$	$- T_0(1+\gamma)^2$	$- T_0(1+\gamma)^3$
Debt Service	0	$- \rho T_0$	$- \rho T_0$	$- \rho T_0$
Net receipts	0	$- \gamma T_0$	$[(1+\gamma)(\rho-\gamma)-\rho]T_0$	$[(1+\gamma)^2(\rho-\gamma)-\rho]T_0$

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*Under the privatize funded plan, retirees receive benefits at t = 0 and then receive the principal and earnings on their savings for all $t > 0$.

** Under the privatize funded plan, employees save these amounts.

(2) $$PVG = \Sigma_1 (\rho-\gamma)T_0(1+\gamma)^{t-1}(1+\delta)^{-t} - \Sigma_1 \rho T_0(1+\delta)^{-t},$$

or, equivalently,

(3) $$PVG \quad (\rho-\gamma)/(\delta-\gamma) - \rho/\delta .$$

Thus, PVG > 0 and privatization raises the present value of consumption only if three conditions are met: $\rho > \gamma$ (the return on capital exceeds the implicit return in the unfunded program), $\rho > \delta$ (the capital intensity of the economy is below the welfare maximizing level) and $\gamma > 0$ (the economy is growing). Why does privatization raise the present value of consumption only when all three conditions are satisfied? First, an unfunded system has an inferior return to employees in each generation only if $\rho > \gamma$. If $\rho \leq \gamma$, the economy is dynamically inefficient and consumption can be raised permanently by reducing the initial capital stock. Even if $\rho > \gamma$, the annual gains $[(\rho-\gamma)T_0(1+\gamma)^t]$ have a present value that exceeds the initial transfer to retirees only if the marginal rate of transformation between present and future consumption exceeds the marginal rate of substitution between consumption in different generations ($\rho > \delta$). Both of these are also the necessary conditions for the introduction of an unfunded program to reduce welfare. If they are not satisfied, an unfunded program raises welfare (even if there are no myopic individuals) and replacing it with a funded private program is therefore welfare decreasing.

The additional condition ($\gamma > 0$) is now required to make the gain from increased retirement income exceed the cost of the additional national debt. A positive rate of growth is

important in this context because the annual gain to retirees grows with the size of the economy while the cost of the increased national debt remains constant. If the economy did not grow, the annual gain to the retirees would remain constant at $(\rho-\gamma)T_0$ which, with $\gamma = 0$ is ρT_0 exactly the same as the cost of debt service.

Privatizing social security raises economic welfare only if the economy is growing because only in a growing economy does the shift to a funded program avoid the rising loss of an increasingly large unfunded program in the future. The privatization at t=0 just substitutes national debt for the existing social security liabilities with no net present value gain but, in a growing economy, privatization prevents the automatic impositions of a larger inefficient social security program in the future.

For any realistic economy, all three inequalities are likely to be satisfied and therefore a shift to funded program is likely to raise economic welfare. The next section discusses the evaluation of γ, ρ and δ and the implied present value gain from a debt financed privatizing of the existing U.S. social security retirement benefits.

3. Parameter Values and the Estimated Net Gain

This section discusses the values of the three key parameters γ, ρ and δ. This establishes the key inequalities [$r > \delta$ and $\delta > \gamma > 0$] and suggests an estimate of the net gain from privatizing social security. The numerical values refer to the United States in the 35 years since 1960 but the experience in other mature industrial countries is unlikely to be qualitatively different.

Aggregate real wage and salary income grew at an average annual rate of 2.6 percent between 1960 and 1994. A broader measure of total labor compensation, including fringe benefits, grew somewhat more rapidly at 3.0 percent. But since the payroll tax is levied only on money wages and salaries, the calculations that follow use $\gamma = 0.026$. Using $\gamma = 0.030$ would not alter the key inequality ($\rho > \gamma > 0$). The higher value of γ would reduce the one-period gain from shifting to a funded system (i.e., would reduce $\rho - \gamma$) but would increase the rate of growth of the gain and would therefore increase the present value of the gain from privatization.[19]

During the years since 1960, the pretax real return to capital in the nonfinancial corporate sector has averaged 9.3 percent.[20] Although federal, state and local taxes take about one-third of this return, the full 9.3 percent does accrue to the benefit of individuals either as lower taxes on other income or as specific government spending. In the simple OLG model, this implies that a dollar saved and invested at time t adds $1+\rho = 1.093$ dollars to income at time t +1 without implying how that extra income is divided between retirees and employees at time t+1.

Using the average rate of growth of wages to estimate γ and the average pretax return on capital to estimate ρ makes no adjustment for risk and risk aversion. During the period from 1960 to 1994, the annual rate of change of aggregate wages varied substantially with a standard deviation of 2.7 percent a year. A more relevant measure of the uncertainty of the return to the

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[19]Recall that from equation 3 the present value of privatization is $PVG = (\rho-\gamma)/(\delta-\gamma) - \rho/\delta$, implying that $dPVG/d\gamma = (\rho-\gamma)/(\delta-\gamma)^2 > 0$.

[20]This calculation combines profits before all taxes on capital income and assets (including federal and state corporate income taxes and state and local property taxes) plus the net interest paid. The calculation, described in Feldstein, Poterba and Dicks-Mireaux (1983) has been brought up to date in Rippe (1995).

individual participant in the unfunded program that is introduced by uncertain income growth is the variation in the growth of aggregate wages over longer periods of time than a single year. During the period between 1960 and 1974 (the last year for which a twenty year growth of wages could be calculated), the forward looking increase in aggregate real wages varied from a low of 1.5 percent to a high of 3.0 percent. A longer history of aggregate real wages would show even more variability. This variability of aggregate real wage growth is translated directly into uncertain retirement benefits if the program is financed on a pay-as-you-go basis with a constant payroll tax rate. Uncertainty about future changes in the tax rate and in the mortality of his employee cohort would add further to the uncertainty of benefits in the unfunded program.

The real return on capital also varies substantially over time. The certainty equivalent yield depends on how this risk is shared through the tax system between the individual savers and the broader public.[21] To consider this issue, I write ρ for the expected pretax real return, r_N for the net of tax return that savers receive, and ρ^* for the certainty equivalent return that can be used in the analysis of sections 1 and 2. This implies that the savers at time t receive a net of tax return of r_N at time $t + 1$ when they are retirees and that the remaining $\rho - r_N$ is collected at time $t + 1$ by the government. If variations in government revenue from this source lead to changes in personal income taxes on employees or to a variety of small changes in government spending programs that affect the papulation as a whole, the risk may be diffused enough so that the mean

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[21]See Arrow and Lind (1970) for a discussion of the appropriate evaluation of risky public expenditure projects. The fundamental principle that they develop is that the value of benefits should be reduced if the risk is born by the individual but that the expected value is an appropriate certainty equivalent for the part of the benefits and costs that the government bears since those costs and benefits, when spread to all taxpayers, are relatively small and uncorrelated with other risks that the taxpayers bear.

of $\rho - r_N$ is a suitable certainty equivalent.[22]

Taxes paid by corporations to federal, state and local governments equaled about 42 percent of the total pretax return, leaving a real net return before personal taxes of 5.5 per cent (Rippe, 1995). On the assumption that the mandatory savings would be exempt from personal income taxes (as it is in private pension accounts and Individual Retirement Accounts), the implied certainty equivalent return on additional capital is therefore the sum of the 3.9 percent expected return received by the government and the certainty equivalent of the 5.5 percent return that accrues to individual savers. The certainty equivalent return on the mandatory saving is thus $\rho^* = 0.039 + r^*_N$ where r^*_N is the certainty equivalent to the portion of the total return that savers receive.

The derivation of equation 3 for the present value gain from privatizing social security implies that

$$(4) \qquad PVG = \{ [\rho^* - \gamma^*] / [\delta - \gamma] - \rho^* / \delta \} T_0 .$$

Note that the γ^* in the numerator refers to the certainty equivalence return in the unfunded social security program. The value of γ in the denominator refers to effect of the economy's growth on the future size of the program and therefore is not a rate or return subject to a certainty equivalence adjustment.

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[22] As a very rough indication of the relevant magnitude, note that federal corporate income tax revenues are only about ten percent of total federal government receipts and that federal state and local capital income taxes are less than ten percent of federal, state and local tax receipts.

It is not clear how much the 5.5 percent mean value of r_N should be reduced because of the uncertain capital yield or how much of the 2.6 percent mean value of γ should be reduced because of the uncertain implicit return in the unfunded program. If both were reduced by equal amounts, the present value gain would actually increase because the gain to the savers would be unchanged while the cost of the additional debt would be lower (the lower value of ρ^* in the second term of equation 4). Two extreme cases will be considered in evaluating the present value gain. The first case ignores the role of uncertainty in calculating the direct gain from privatization, leading to an understatement of the gain if $\rho^* - \gamma^* = \rho - \gamma$ and $\rho^* < \rho$. If however the risk of the financial investment exceeds the risk of the unfunded return ($\rho - \rho^* > \gamma - \gamma^*$) this will overstate the gain from privatization. The second calculation therefore leans in the opposite direction by making no risk adjustment in the return on the unfunded program ($\gamma = \gamma^*$) but in assuming that the certainty equivalent of the private yield on real investment (r^*_N) can be approximated by the real yield on medium term government bonds. Between 1960 and 1994, the real yield on 10 year government bonds (r_G) averaged approximately 0.025.[23] Since the mean value of r_N was 0.055, the implied value of $\rho^* = 0.093 - (r_N - r_G) = 0.063$.[24]

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[23]This uses the actual inflation rates until 1994 and assumes that prices rise at 3.0 percent between 1995 and 2004.

[24]An alternative calculation would assume that the yield on government bonds net of personal income taxes was the certainty equivalent of the yield on private corporate capital net of personal taxes. Assuming a 20 percent marginal tax rate ($\tau = 0.20$) on the return to ordinary savings (to reflect the deferral of taxes on capital gains and the levying of taxes on nominal interest and nominal gains), the 5.5 percent return after corporate taxes would decrease to a net return of $(1-\tau)\, r_N = 0.044$. The corresponding real return on government bonds from 1960 to 1994, net of a 20 percent personal tax on the nominal interest payments, was $r_{GN} = 0.010$. Using these figures, the risk adjusted private return becomes $\rho^{**} = 0.093 - [(1-\tau)\, r_N - r_{GN}\ ] = 0.059$, very similar to the value calculated on the pretax basis.

There are two conceptually different approaches to defining the appropriate rate of intergenerational discounting (δ). The first begins with the view that the generations are linked by family altruism so that the appropriate rate of discount between generations is the same as the rate of discount within generations. This implies that the relevant discount rate is the real net yield that individuals receive. If considerations of risk are ignored, this implies $\delta = (1-\tau)\, r_N$ where τ is the marginal individual tax rate and r_N is the return after corporate taxes but before individual taxes. With a relatively conservative estimate of $\tau = 0.2$ and with $r_N = 0.055$, this approach implies $\delta = 0.044$. If the real net return on government bonds is regarded as a more appropriate risk adjusted measure, $\delta = r_{GN} = 0.010$. In either case it is clear that $\rho > \delta$. Using $\delta = r_{GN}$ implies that $\delta < \gamma$ and therefore that the appropriate discount rate is less than the rate of growth of the social security program. In this case, the present values in equations 1, 2 and 3 do not exist; the loss of income of an unfunded social security program $(\rho^* - \gamma^*)T_0(1+\gamma)^t$ grows faster than the discount factor. ut although the present value is not defined, it is clear that the discounted loss of introducing an unfunded social security program exceeds the value of the initial transfer within a finite number of years. Similarly, the discounted gain from a debt financed transition to a funded program exceeds the cost within a finite number of years.

The second approach to defining δ rejects the use of a market rate for intergenerational discounting on the grounds that the generations are not linked by operative bequest motives and that the preferences of the current generation should not determine the relative values to be put on consumption in future generations. The rate of discount must therefore be derived from the structure of the utility function. he common assumption of an additive separable constant

elasticity utility function implies that $\delta = (\gamma - n)\,\varepsilon$ where $\gamma - n$ is the rate of increase of per capita incomes and ε is the absolute elasticity of marginal utility.[25]

Between 1960 and 1994, the population growth rate was n= 0.011, implying γ - n = 0.015. Plausible values of the elasticity of the marginal utility function are generally taken to be about $\varepsilon = 2$, implying that $0 < \gamma < \delta < \rho$, the condition that implies a positive but finite discounted value of the gains from a debt financed shift from an unfunded social security program to a funded program. Values of $\varepsilon < 1.7$ imply $\delta < \gamma$ and therefore that the gains from shifting to a funded program grow faster than the discount rate. In this range, the present value gain from a debt financed shift to a funded program increases without limit as the time horizon is extended. Only an implausibly high $\varepsilon > 4.2$ would imply $\delta > \rho^* = 0.063$ and therefore a net loss from a debt financed shift to a funded system.

Equation 4 indicates the relation between the three key parameters (ρ^*, γ^* and δ) and the present value gain of debt financed privatization per dollar of T_0. The empirical interpretation of T_0 is the present actuarial value of the benefits to which current retirees and workers would be entitled if the unfunded program continued minus the present value of the corresponding future social security taxes that they would pay. This is the value of the government's implicit net social security debt that would be made explicit in a debt-financed privatization. This magnitude, which I have previously labeled net social security wealth (Feldstein, 1974), is

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[25]Let the social welfare function be $\Sigma\, u(c_t)$ where c_0 is mean per capita consumption at time t and $u(c_t) = k\, c_t^{\varepsilon+1}$. Then $1 + \delta = MRS\,(c_t, c_{t+1}) = (1+\gamma-n)^{\varepsilon} \cong 1 + (\gamma - n)\,\varepsilon$.

currently about $11,265 billion.[26]

Table 2 presents alternative estimates of the present value gain per dollar of net social security wealth (PVG/ T_0) implied by equation 4. The results are quite sensitive to the intergenerational discount rate (δ) but indicate a very large gain for any plausible value of the discount rate. The first column assumes the relatively high discount rate equal to the real net of tax return of current investors in a mixed debt-equity portfolio, $\delta = 0.044$. With no risk adjustment ($\rho^* = \rho = 0.093$ and $\gamma^* = \gamma = 0.026$) and with $\delta = 0.044$, a debt financed privatization of social security wealth would produce a present value gain of 1.6 dollars per dollar of net social security wealth (NSSW). With NSSW = $11,265 billion, this implied gain is a very substantial $18 trillion or more than 2.5 times current GDP.

Adjusting the return on capital and the implicit return on the unfunded program in a way that keeps the risk adjusted difference between the two returns the same as the pre-adjusted difference ($\rho^* = 0.064$ and $\rho^* - \gamma^* = \rho - \gamma$) implies a higher present value gain of 2.2 dollars per dollar of net social security wealth. The very conservative assumption that the return on capital should be reduced because of risk ($\rho^* = 0.063$) but that no risk adjust need be made in the social security return ($\gamma^* = \gamma = 0.026$) implies a present value gain of 0.6 times the NSSW or approximately $6.7 trillion, slightly greater than GDP.

The implied gains are quite sensitive to the assumed rate of discount used for

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[26]The method of calculating net social security wealth is described in Feldstein (1974). For current employees, the future taxes are now assumed to be given by existing law. The original calculations of social security wealth have been updated in Feldstein (1995b) through 1992. The value of net social security wealth for 1992 in 1987 dollars was $7,937. This number is adjusted to the 1992 price level and then extrapolated from 1992 and 1995 at the same rate as gross domestic product.

intertemporal aggregation. The value of $\delta = 0.044$ is high in the sense that it is based on the net return to investors who hold the economy-wide mix of equity and corporate debt. Using the real net return on long-term government bonds implies $\delta = 0.01$, a value at which the discounted sum of the growing stream of annual gains does not converge. Even a value of $\delta = 0.03$ implies (see column 2 of table 2) net gains that rise from 7.2 times net social security wealth to 14.5 times net social security wealth, depending on the assumed risk adjustments.

4. Concluding Comments: The Political Economy of Privatizing Social Security

Although a debt financed privatization of social security implies very large gains in the present value of consumption, a majority of the adult population (i.e., employees and retirees) alive at the time of the privatization might be made worse off. If so, their opposition could make privatization politically impossible. To see how this can occur, consider again the calculations shown in Table 1. The retirees at the time of the shift (at $t = 0$) are unaffected; they receive bonds in lieu of benefits do not have to contribute to the new debt service since the first interest payments are not due until $t = 1$. The more numerous employees at time $t = 0$ now contribute T_0 to funded saving accounts. They can expect to benefit from the higher retirement income $(\rho - \gamma)T_0$ at $t=1$ but may share in the additional debt service ρT_0. If their share of the tax to finance

Table 2

Gain from Debt Financed Social Security Privatization

The Present Value Gain per Dollar of Net Social Security Wealth

	Discount Rate	
	$\delta = 0.044$	$\delta = 0.030$
No Risk Adjustment		
$\rho^* = \rho = 0.093, \gamma^* = \gamma = 0.026$	1.6	13.7
Equal Risk Adjustment		
$\rho^* - \gamma^* = \rho - \gamma = 0.067$ $\rho^* = 0.063$	2.2	14.5
Risk Adjustment for Capital Only		
$\rho^* = 0.063, \gamma^* = 0.026$	0.6	7.2

this debt service exceeds $\rho-\gamma$, they will be made worse off and would vote against the privatization. A political majority in favor of privatization might be formed in this simple model by shifting more of the tax burden to the employees who will enter the labor force at t=1 or by "temporarily" increasing the debt again at t=1 to finance the interest that is then due. It is of course possible to keep postponing the debt service in a way that causes the resulting debt growth to eliminate the gain from privatization.

In spite of the potential difficulty of obtaining a majority to support a welfare increasing privatization, the very substantial present value gain that would result suggests that it may be possible to develop a more complex series of debt financed partial privatizations that eventually produces a full privatization and that does so without imposing a net loss on any individual.[27]

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[27]Feldstein and Samwick (1995) examine the possibility of such a Pareto improving privatization process with the help of a more realistic and detailed model of taxation and individual saving behavior.

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