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Introduction

Martin Feldstein

Reforming the social security retirement program is an issue of enormous practical importance. Although elected officials are still unwilling to confront the serious problems of our social security system, its deteriorating financial condition will eventually force major reforms. Whether those reforms are good or bad, whether they deal with the basic economic problems of the system or merely protect the solvency of existing institutional arrangements, will depend in part on whether economists provide the appropriate intellectual framework for analyzing reform alternatives. The papers presented in this volume represent an attempt to contribute to that framework.

Major policy changes that affect the public at large can happen in our democracy only when there is widespread public support for the new direction of policy. In the field of economics, the views of the media, of other private-sector opinion leaders, and of politicians and their advisers depend very much on their perception of what economists believe is feasible and correct. Fundamental policy reforms in a complex area like social security also require the development of technical expertise, both in and out of government, about the options for change and the likely consequences of alternative reforms. Fortunately, as the papers and discussion reported in this volume show, an expanding group of economists is now thinking and writing about social security reform.

Part 1 of this volume contains studies of the actual experience with priva-

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tizing social security in five very different countries: Chile, Australia, the United Kingdom, Mexico, and Argentina. Part 2 deals with a variety of practical issues that the United States will have to face if we as a nation want to make a similar transition to a system of individual funded accounts. This introduction provides background for the subsequent chapters by discussing the economic costs imposed by an unfunded social security system and the nature of the gains that would be achieved by switching to a funded system. It then summarizes the questions that are considered in the individual country studies and reviews the subjects of the chapters that deal with the United States.

Before going further, a word about the term *privatizing social security* is in order. The term *privatize* is ambiguous and raises political objections if it suggests an abrogation of government responsibility for the income of the aged. In this volume, *privatizing social security* refers to the shift from unfunded pay-as-you-go programs to mandatory funded programs with individual accounts. Because the contributions are mandatory, the government retains responsibility for assuring retirement income to all. The benefits of a funded system that are discussed in this volume refer to capital accumulation and to the resulting reduction in labor market distortions. I take the essence of privatizing to be whether individuals are also given control over their own investments. In a funded but not privatized system, the government would have to invest in private stocks, bonds, and mortgages. There are obvious reasons for not wanting the government to acquire very large investments in individual private companies. Although the administrative costs may be higher when individuals have control over their investments, major U.S. mutual funds have reduced their expenses to less than one-quarter of 1 percent of assets. Even in a privatized system, the government might constrain the mix of assets in which individuals are permitted to invest and might provide a general safety net to protect individuals whose investments did not produce adequate retirement income. The chapters in part 1 of this volume consider the way that different countries have dealt with these issues, while Mitchell (chap. 10) discusses administrative issues in more detail.

The Magnitude of the Problem

The social security program of retirement, disability, and survivor benefits is the largest program of the U.S. government, with outlays of more than $350 billion in 1997. The 12.4 percent employer-employee payroll tax that is earmarked for social security exceeds the income tax obligations for most taxpayers. An alternative measure of the magnitude of the social security program is *social security wealth*, the present actuarial value of the social security benefits to which the current adult population will be entitled at age sixty-five (or to which they are already entitled if they are older than sixty-five) minus the present value of the social security taxes that they will pay before reaching age

sixty-five.[1] Social security wealth had grown by 1995 to about $7 trillion, equal to the size of the GDP.[2] Since that is equivalent to more than $35,000 for every adult in the country, the value of social security wealth substantially exceeds all other financial assets for the vast majority of American households. In the aggregate, social security wealth exceeds the combined value of pension and life insurance reserves and equals nearly half of all private financial wealth as conventionally measured.

Social security wealth is of course not real wealth but only a claim on current and future taxpayers. Instead of labeling this key magnitude *social security wealth,* I could have called it the nation's *net social security liability.* Like ordinary government debt, social security wealth has the power to crowd out private capital accumulation. And social security wealth will continue to grow as long as our current system remains unchanged, displacing an even larger stock of capital.

The $7 trillion social security liability in 1995 was twice as large as the official national debt. Even if the officially defined budget deficit is eliminated in 2002 so that the traditional national debt is no longer increasing, the real national debt in the form of the social security liability is currently scheduled to increase in that year by more than $300 billion.[3]

Looking further into the future, the aggregate social security liability will grow as the population expands, as it becomes relatively older, and as incomes rise. Government actuaries predict that, under existing law, the tax rate required to pay each year's social security benefit will rise over the next fifty years from the present level of slightly less than 12 percent to more than 18 percent and perhaps to as much as 23 percent.[4]

The financial problems of the social security system are therefore very serious indeed. But even more fundamental are the economic effects of continuing with an unfunded system. The next section discusses the large deadweight loss that an unfunded system causes by distorting the supply of labor and the form

1. The concept of *social security wealth* was introduced and defined explicitly in Feldstein (1974).

2. This estimate is based on the disaggregated model presented in Feldstein and Samwick (chap. 6 in this volume), which has been calibrated to the aggregate benefits projected by the social security actuaries. An earlier calculation reported in Feldstein (1996a) was based on a simpler estimation procedure that assumed a faster growth of future benefits.

3. These increases in social security wealth and its liability twin are the core of the massive intergenerational transfers that Auerbach, Gokhale, and Kotlikoff (1991, 1994) have warned us about in their important studies of generational accounting.

4. The 18 percent rate is based on what the social security actuaries call their intermediate alternative II assumptions, while the 23 percent rate is based on the somewhat more pessimistic alternative III assumptions. Experience suggests that even these alarming predictions may be too optimistic. In 1983, the social security actuaries calculated that a 12 percent rate would be enough to finance social security benefits until the year 2065. A dozen years later, these projections have been revised to show that the social security fund will be exhausted by 2031 if the tax rate is not increased or benefits reduced.

of compensation. I then discuss the intertemporal welfare loss that results from depressed capital accumulation and the potential gain from shifting to a funded system.[5]

A common feature of all the foreign systems discussed in this volume is the provision of a universal system of retirement benefits for the aged. The analyses of the United States in this volume also assume that the nation is politically committed to such a universal system. An alternative would be a means-tested system that provides benefits only to those individuals who, through inadvertence, bad luck, or strategic behavior, reach old age with income and assets that are below some specified level. Although I believe that such an alternative deserves careful consideration, this possibility has not been studied in the current project.[6]

The Deadweight Loss of the Labor Market Distortions

The social security payroll tax distorts the supply of labor and the form of compensation.[7] Moreover, although the link between the social security taxes that individuals pay and their subsequent benefits means that the statutory payroll tax rate overstates the effective individual marginal tax rates, the mandatory social security contributions are nevertheless real taxes with very substantial deadweight losses. These losses are inevitable because of the low return implied by the pay-as-you-go character of the unfunded social security system.

Unlike private pensions and individual retirement accounts, the social security system does not invest the money that it collects in stocks and bonds but pays those funds out as benefits in the same year that they are collected.[8] The rate of return that individuals earn on their mandatory social security contributions is therefore far less than they could earn in a private pension or in a funded social security system. As Paul Samuelson (1958) first taught us forty years ago, an unfunded social security program with a constant tax rate provides a positive rate of return that, in equilibrium, is equal to the rate of growth of the social security payroll tax base. The 2.6 percent average annual rate of

5. For an earlier discussion of the potential effect of a social security fund on national capital accumulation, see Feldstein (1975, 1977).

6. For an analysis of the conditions under which an unfunded means-tested system would provide a higher level of social welfare than an unfunded universal program, see Feldstein (1987a). It would be desirable to extend this analysis to include the possibility of funding both alternatives. The foreign programs described in pt. 1 of this volume generally provide an unfunded safety net in addition to the mandatory funded accounts.

7. I do not discuss the distortion to the retirement decision because that could be remedied by eliminating the retirement test and by other changes within the unfunded system.

8. Although the social security system has been accumulating a fund since 1983 to smooth the path of tax rates, more than 90 percent of payroll tax receipts are still paid out immediately as benefits, and the assets in the social security trust fund are only about 5 percent of the social security liabilities.

growth of real wages and salaries since 1960 can therefore illustrate the yield of an unfunded social security program.[9]

I might just note that, in contrast to this 2.6 percent potential future yield, the rate of return on social security contributions since the inception of the program has been kept artificially high by the sharp increase in the social security tax rate.[10] The combined employer-employee tax rate rose from just 2 percent in 1940 to 3 percent in 1950, 6 percent in 1960, 10 percent in 1980, and 12 percent since 1988. Thus, those who got in on the ground floor of the social security program and are now retired paid taxes at relatively low rates but are receiving benefits that are financed by a much higher tax rate on current employees. The resulting very high real return on social security contributions has sustained political support for the existing system. But such a sixfold increase in tax rates cannot happen again.[11]

In contrast to the 2.6 percent "equilibrium" return on social security contributions, the real pretax return on nonfinancial corporate capital averaged 9.3 percent over the same thirty-five-year period since 1960.[12] That is the return that each individual's retirement saving could have earned in a fully funded government system or in a privatized system if the government credited the corporate tax receipts back to each account. The difference between the 2.6 percent social security return and the 9.3 percent real return implies that mandatory contributions to an unfunded social security plan are real taxes with a very substantial deadweight loss.[13]

A simplified example will indicate the magnitude of the implied tax wedge. Consider an employee who contributes $1,000 to social security at age forty-five to buy benefits that will be paid at age seventy-five. With a 2.6 percent yield, the $1,000 grows to $2,160 after the thirty years. In contrast, a yield of 9.3 percent would allow the individual to buy the same $2,160 retirement in-

9. The social security actuaries now contemplate an even lower long-term real rate of return of about 2.0 percent because of the slower growth of the population and of real wages.

10. Samuelson's (1958) analysis shows that the rate of return is equal to the rate of growth of the tax base plus the rate of growth of the tax rate.

11. The increases in the payroll tax rate that are projected for the next fifty years are needed just to offset the changing demographic structure and the lower growth of earnings; they do not imply higher rates of return. As noted above, the rapid aging of the population and other recent changes imply that the return would be significantly lower than 2.6 percent for the current younger generation of employees.

12. This 9.3 percent return combines profits before all federal, state, and local taxes with the net interest paid. The method of calculation (described in Feldstein, Poterba, and Dicks-Mireaux 1983) has been applied to the more recent data in Poterba and Samwick (1995) and Rippe (1995).

13. In practice, individuals do not earn the full 9.3 percent pretax rate of return even on retirement saving. Individual retirement accounts and private pension plans earn that return net of federal, state, and local corporate taxes. Since those taxes averaged 42 percent of the pretax return (Rippe 1995), the real net yield available to savers has been about 5.4 percent. In principle, however, a funded retirement system could deliver the full 9.3 percent pretax return to each individual saver. But even the lower 5.4 percent net return implies that the social security contributions are a substantial tax.

come for only \$150.[14] Thus, forcing individuals to use the unfunded system dramatically increases their cost of buying retirement income. In the current example, a funded plan would permit individuals to buy retirement income at just 15 percent of the price that they must pay in the unfunded program, allowing the 12.4 percent social security tax rate to be replaced by a 1.9 percent contribution. The remaining 10.5 percent excess mandatory contribution is a real tax for which the individual gets nothing in return.[15]

The deadweight loss caused by this 10.5 percent tax is much larger than the "small triangle" that typically comes to mind when we think of deadweight losses. This is true for two distinct reasons.

First, because the social security payroll tax is imposed on top of federal and state income taxes, the deadweight loss is not a small triangle but a much larger trapezoid. With a federal marginal tax rate of 28 percent (for single individuals with taxable incomes over \$23,000 and married couples with combined incomes over \$38,000) and a typical state income tax rate of 5 percent, the social security tax comes on top of an initial 33 percent marginal income tax rate.[16] A little arithmetic shows that the incremental deadweight loss that results from the additional 10.5 percent net social security tax is equal to 4.6 percent of the product of the payroll tax base and the compensated elasticity of that tax base with respect to the net of tax share.[17] That is about ten times as large as the deadweight loss that would result if the social security tax were the only tax.

The second reason that the deadweight loss is substantially larger than is commonly assumed is that the payroll tax distorts much more than the number of hours that individuals work. More specifically, it affects such other dimensions of labor supply as occupational choice, location, and effort. It also distorts the form in which compensation is taken, shifting taxable cash into untaxed fringe benefits, nice working conditions, etc. These distortions to the

14. With a 5.4 percent net rate of return, the individual can buy the \$2,160 retirement income for \$446, less than half the cost with the unfunded social security program.

15. The extent of the effective tax depends on the taxpayer's age (or, more generally, on the amount of time that will elapse between the payment of the tax and the receipt of the benefit). Replacing the forty-five-year-old in the example with a thirty-five-year-old who has forty years until retirement raises the net tax from 10.5 to 11.4 percent, while raising the age of the individual to sixty reduces the net tax to 7.6 percent.

16. The combination of the 33 percent rate and the 10.5 percent net social security tax implies a 43.5 percent rate. However, since employers pay half the 15.3 percent statutory payroll tax, the marginal tax rate on the full pretax marginal product of labor is (43.5/1.0765 =) 40.4 percent.

17. Edgar Browning (1987) showed that, when the relevant behavioral elasticity is measured in the presence of the tax, the original Harberger (1964) formula for the deadweight loss of a tax with marginal tax rate t on a wage base of wL must be modified to DWL = $0.5\ \varepsilon t^2 wL/(1 - t)$, where ε is the compensated elasticity of the tax base (wL) with respect to the marginal net of tax share, $1 - t$. The increase in the deadweight loss because the marginal tax rate is at t_2 rather than t_1 is therefore $\Delta\text{DWL} = 0.5\varepsilon(t_2^2 - t_1^2)wL/(1 - t_2)$. Thus, a pure payroll tax of (10.5/1.0765 =) 9.8 percent with no other tax present would induce a deadweight loss of $0.0053\varepsilon wL$. But, in the presence of a preexisting income tax of 33 percent, the 10.5 percent payroll tax raises the deadweight loss by $\Delta\text{DWL} = 0.046\varepsilon wL$.

form of compensation are in effect distortions to the individual's pattern of consumption. They are, dollar for dollar, as important as the distortions to labor supply. In a recent paper (Feldstein 1995c), I showed that the deadweight loss caused by this full range of distortions—the number of working hours, the broader dimensions of labor supply, and the pattern of consumption implied by the form of compensation and by the use of tax deductions—can be evaluated quite simply in the traditional Harberger framework by using the compensated elasticity of taxable income (with respect to the net of tax share) in place of the usual compensated elasticity of labor supply. Because there are so many aspects of behavior that affect taxable income, this elasticity (and therefore the associated deadweight loss) is much larger than the traditional supply elasticity of working hours.

To estimate the elasticity of total taxable income with respect to the net of tax rate, I studied the tax returns of a panel of taxpayers before and after the 1986 Tax Reform Act (Feldstein 1995a). These data imply a range of elasticity estimates between 1 and 1.5, all much larger than the traditional labor supply elasticity.[18]

This elasticity of the income tax base is likely to exceed the elasticity of the social security payroll tax base because itemized deductions and changes in portfolio income do not influence the base of the payroll tax. To be very conservative, for the current calculation I assume that the relevant compensated elasticity of the payroll tax base with respect to the net of tax share is only 0.5.

Putting these pieces together implies that the deadweight loss due to the net social security tax is about 2.3 percent of the social security payroll tax base—about $67 billion in 1995.[19] This deadweight loss is about 1 percent of GDP and about one-fifth of total social security payroll tax revenue.

In practice, the deadweight loss of the payroll tax is exacerbated by the haphazard relations between benefits and taxes that result from existing social security rules. For example, because benefits are based on the highest thirty-five years of earnings, most employees under age twenty-five receive no additional benefit for their payroll taxes. Because many married women and widows claim benefits based on their husbands' earnings, they also often receive no

18. These estimates relate to the experience of taxpayers with 1985 incomes over $30,000 and may not be appropriate for the entire population. A similar study by Gerald Auten and Robert Carroll (1994), using a much larger set of panel data that is available only inside the Treasury Department, estimated the elasticity to be 1.33, with a standard error of 0.15. In a more recent study (Feldstein and Feenberg 1996), Daniel Feenberg and I used the 1993 tax rate increases to estimate the elasticity implied by the experience after the 1993 tax rate increases. We found a short-run compensated elasticity of 0.74, although the interpretation of this is clouded by the lack of panel data and by transition issues.

19. Total wages taxable by the OASDI payroll tax in 1992 were $2.5 trillion. Scaling this up to the 1995 level by the increase in total wage and salary disbursements implies a 1995 tax base of $2.9 trillion. Since the payroll tax applied only to wages up to $61,200 per person in 1995, this $2.9 trillion should be reduced by the entire income of the individuals who earn $61,200 or more (for whom the payroll tax has no marginal tax consequence), not just by the portion of their incomes over $61,200.

benefit in return for their payroll taxes. Because there is no extra reward for taxes paid at an early date, the effective tax rate on younger taxpayers can be a substantial multiple of the effective tax rate of older employees. Indeed, older men who are married can actually face a negative marginal social security tax rate, receiving more than a dollar in actuarially expected future benefits for every dollar that they pay in payroll taxes (Feldstein and Samwick 1992). The social security rules are so complex and so opaque that many individuals may simply disregard the benefits that they earn from additional working, therefore acting as if the entire payroll tax is a net tax no different in kind from the personal income tax.

The extra deadweight loss that results from these very unequal links between incremental taxes and incremental benefits would automatically be eliminated in a privatized funded system with individual retirement accounts. It can, however, also be eliminated within the existing unfunded system by creating individual social security accounts for each taxpayer (as James Buchanan [1968] suggested many years ago), crediting the account with the individual's tax payments and imputing the average pay-as-you-go return of 2.6 percent.[20] But the labor market distortions and the resulting deadweight loss that result from the low rate of return in an unfunded system cannot be eliminated without shifting to either a funded public system or a privatized system of individual retirement accounts.[21]

The Welfare Loss of Reduced National Saving

The deadweight loss that results from labor market distortions is not the only adverse effect of an unfunded social security system or even the largest one. Even if there were no distortions to the labor supply or to the form of compensation (i.e., even if the compensated elasticity of the tax base with respect to net of tax rate were zero), each generation after the initial one would lose by being forced to participate in a low-yielding unfunded program, that is, by being forced to accept a pay-as-you-go implicit return of 2.6 percent when the real marginal product of capital is 9.3 percent. Even though capital income taxes now prevent individuals from receiving that 9.3 percent on their own savings, the public as a whole does receive that full return; what individuals do not receive directly they receive in the form of reductions in other taxes or increases in government services.

20. Tax payments or mandatory contributions of husbands and wives could be pooled and divided into two separate accounts, thereby providing protection in case of divorce. A fraction of the contributions could be automatically devoted to the purchase of life insurance. I do not explore these important issues further here.

21. Auerbach and Kotlikoff (1987) and Kotlikoff (1996) examine a special model in which the labor market distortions can be eliminated in an unfunded system by having a higher *marginal* link of benefits to taxes than the average benefit-tax ratio. They achieve this with a lump sum tax on all employees. This creates no problem in their analysis since all employees are assumed to have the same income. In practice, however, a lump sum tax that is large enough to eliminate the marginal payroll tax distortion would make the social security payroll tax very regressive.

The extent to which an unfunded social security system causes a decline in national capital income and economic welfare depends on how individual saving responds to social security taxes and benefits and on how the government acts to offset the reductions in private saving.

Consider first the effect on individual saving. Individuals who have had average earnings during their entire working life and who retire at age sixty-five with a "dependent spouse" now receive benefits equal to 63 percent of their earnings during the full year before retirement. Since the social security benefits of such individuals are not taxed, those benefits replace more than 80 percent of peak preretirement net-of-tax income. Common sense and casual observation suggest that individuals who can expect such a high replacement rate will do little saving for their retirement. Such saving as they do during their preretirement years is more likely to be for precautionary balances to deal with unexpected changes in income or consumption. Not surprisingly, the median financial assets of households with heads aged fifty-five to sixty-four were only $8,300 in 1991, substantially less than six months' income. Even if we look beyond financial wealth, the median net worth (including the value of the home) among all households under sixty-five years of age was only $28,000.

To get a sense of the order of magnitude of the resulting annual loss of aggregate income, it is helpful to begin with the simplest case in which each dollar of social security wealth reduces real private wealth by a dollar.[22] Since the forgone private wealth would have earned the marginal product of capital while the unfunded social security system provides a return equal to the growth of aggregate wages, the population incurs a loss equal to the difference between those two returns. With a marginal product of capital of 9.3 percent and a social security return of 2.6 percent, the annual loss of real income is 6.7 percent of social security wealth. The social security wealth of $7 trillion in 1995 implies an annual loss in that year of $470 billion, or more than 6 percent of total GDP.

Of course, this loss is not directly comparable to the deadweight loss associated with the distortions to labor supply and to the form of compensation. Although this loss of investment income affects all generations that pay social security taxes, a full welfare evaluation requires comparing these losses to the gain of the initial generation of retirees who received benefits without making any contribution and the gains of subsequent retirees who received windfall benefit increases as tax rates rose.

More generally, this massive potential loss must be qualified by addressing three questions. First, how much does the social security system actually depress real capital accumulation? The capital income loss occurs only to the extent that the capital stock would be higher with private saving or a funded program. Second, how should risk be taken into account in evaluating the loss of real income per dollar of forgone capital accumulation? Third, how should the windfall gain to the initial generation that received social security benefits

22. I discuss the evidence about the effect of social security on saving below.

without making any contribution be balanced against these subsequent losses? I deal briefly with each and then turn to the potential benefit of shifting to a privatized funded social security program.

The Induced Change in National Saving

To assess the effect of the existing social security system on national saving we must recognize that social security affects public saving as well as private saving. Consider first the effect on public saving. The official surplus of the social security fund in fiscal year 1995 was $69 billion. To what extent does this social security surplus actually increase real national saving and investment? The common criticism, that such a surplus does not raise real investment because it is invested exclusively in government bonds, is incorrect. If the social security trust fund buys government bonds that would otherwise have been sold to the public, it prevents an equal amount of crowding out and thereby does raise the level of real investment.

The critical issue is therefore how the existence of the social security surplus affects the size of the overall (unified) budget deficit. The current budget discussions about achieving a balanced budget in the year 2002 use the projected social security surplus of $111 billion in that year to offset projected deficits elsewhere in the budget. If the goal of a balanced budget in 2002 would have been set even if there were no projected social security surplus, then the existence of the surplus does not reduce the projected total budget deficit and therefore does not affect the projected future national savings available for investment. But, if, as seems more likely, in the absence of a social security surplus Congress and the president would have targeted a deficit in 2002 (with the budget balanced in some later year), then the projected social security surplus does increase projected national saving to some extent, although less than the full amount of the projected surplus.

Similarly, the actual deficit in 1995 would probably have been larger without the $69 billion social security surplus, but not $69 billion larger because Congress and the president would have enacted other legislation to reduce the budget deficit. Thus, some part, but only some part, of the $69 billion current social security surplus probably does help offset the decline in private saving. But, since the $69 billion annual surplus is only one-sixth of social security receipts and the entire social security trust fund is now less than 10 percent of social security wealth, the offsetting effect of public saving is not a major consideration.

The key issue is therefore the extent to which social security wealth reduces private saving. Economic theory alone cannot provide an unambiguous answer. Even if all individuals were rational life-cycle savers, each dollar of social security wealth would not necessarily replace exactly a dollar of real wealth. To the extent that the income-tested character of social security benefits induces earlier retirement, individuals will save more than they otherwise would.

The relative importance of this induced retirement effect and of the more basic wealth replacement effect will vary from individual to individual (Feldstein 1974). Social security also affects private saving through an income effect and by providing a real annuity.[23] Finally, an unknown number of individuals who are irrational or myopic may not respond at all to the provision of social security benefits.

Thus, the extent to which social security wealth substitutes for private real wealth accumulation is an empirical issue. A substantial amount of research has been conducted on this question. Like every other important and complex issue in economics, different studies do not all point to the same conclusion. That is inevitable in empirical economics. As I have argued in a different context (Feldstein 1982), all empirical specifications in economics are false models, oversimplifications that cannot be literally true. Statistical estimates must therefore be interpreted with a sensitivity to potential biases, simplifications, data quality problems, and the like. In the end, the researcher must make a judgment based on all the evidence rather than by applying traditional theories of statistical inference to any individual study.

What, then, does the evidence tell us about the effect of social security on private saving? At the most basic level is the fact, to which I have already referred, that most households accumulate little or no financial assets. This is consistent with a rational decision to substitute social security benefits for private wealth accumulation (Diamond 1977), but it could also be interpreted as evidence that individuals are completely myopic, providing nothing for their old age whether or not there are social security benefits. However, studies based on cross sections of household data (including Blinder, Gordon, and Wise 1983; Diamond and Hausman 1984; and Feldstein and Pellechio 1979) support the substitution hypothesis. Although there remain serious problems of statistical identification and data quality and a wide range of parameter estimates, I interpret the cross-sectional evidence as implying that each extra dollar of social security wealth replaces about fifty cents of private wealth accumulation. Finally, there are the time-series studies linking social security wealth to aggregate private saving and consumption (see, e.g., Barro 1978; Esposito 1978; Feldstein 1974; and Leimer and Lesnoy 1982). I recently reestimated the specification presented in Feldstein (1974) using time-series

23. In principle, individuals who have operative utility-maximizing bequest motives might offset fully the effect of social security wealth by increasing their saving in order to compensate future generations for the tax burdens implied by the social security liabilities (Barro 1974). I doubt that that effect is empirically very important. My own judgment on this "Ricardian equivalence" issue is that very few of the individuals who are affected by social security have operative bequest motives. Because future generations can be expected to have higher real incomes, even parents who include their children's consumption or utility in their own utility functions may prefer to receive gifts rather than to make bequests. If children do not wish to support their parents, the result is a corner solution in which loving parents do not compensate their children when the value of the social security liability increases. On the empirical irrelevance of Ricardian equivalence, see, e.g., Altonji, Hayashi, and Kotlikoff (1992). See also Bernheim (1989).

data through 1992 and tested some of the specifications that others had examined with earlier data (Feldstein 1996b). The new parameter values are remarkably close to my original estimates and imply that the existing social security wealth reduces overall private saving by nearly 60 percent.

Although none of these studies establishes definitively a precise substitution of social security wealth for other household wealth, I believe that, taken together, these studies do imply that the social security program causes each generation to reduce its savings substantially and thereby to incur a substantial loss of real investment income.[24]

That the displacement of private saving by social security is less than complete reduces the loss that each generation incurs from the imposition of an unfunded program. But, even if each dollar of social security wealth displaces only fifty cents of private wealth accumulation, the annual loss of national income would exceed 4 percent of GDP.[25]

In assessing the aggregate welfare effect of a social security program, the loss that results from the depressed level of real capital accumulation must be balanced not only against the windfall gain of the earlier retirees but also against the gain in protection to those myopic individuals who would otherwise have saved too little for their old age.[26] Such an analysis is not necessary, however, to assess the loss that results from using an unfunded instead of a funded program to provide benefits. But, in order to do so, it is necessary to consider

24. The decline in the size of the domestic capital stock depends also on the extent to which a lower rate of saving induces an increased net inflow of capital from abroad. If capital flowed internationally to maintain the same rate of return everywhere, a decline in the U.S. saving rate would induce an equal offsetting inflow from abroad. Although the net-of-tax return on this capital would go to the foreign suppliers of this capital, the U.S. government would collect taxes on the equity portion of this investment, and the U.S. public would gain a corresponding amount. The evidence suggests, however, that the international capital market is sufficiently segmented that relatively little capital flows to replace the lost U.S. saving (see Feldstein and Horioka 1980; Feldstein 1994; and Mussa and Goldstein 1993).

25. Increasing the capital stock by half the 1995 net social security wealth of $7 trillion would raise capital income by more than $300 billion, or 4 percent of GDP, if the rate of return remained unchanged at 9.3 percent. Such a large increase in the capital stock would of course reduce the marginal product of capital. If all the increase in the capital stock went into the domestic capital stock (i.e., if there were no change in international capital flows), a Cobb-Douglas production function with a labor coefficient equal to the share of compensation in national income implies that the marginal product of capital would be depressed from 9.3 to 7.9 percent if the incremental capital went only into the business sector (i.e., excluding owner occupied housing) and to 8.3 percent if the entire capital stock were increased. Of course, the lower return to capital would be matched by a higher return to labor. An increase in the capital stock equal to half of net social security wealth would raise the capital stock by about 16 percent and would therefore raise national income by 3.8 percent.

26. If public policy is committed to an unfunded social security program, setting the appropriate level of benefits requires balancing the protection of the myopic undersavers against the loss to others that results from replacing high yield real capital accumulation with the low implicit social security yield. I have examined this optimization problem with the help of some simple models (Feldstein 1985) and concluded that, with realistic estimates of the yield on capital and the return on the pay-as-you-go social security system, the replacement ratio of social security benefits to past earnings should be very much lower than it is in the current system.

first how the returns on real capital and on social security contributions should be adjusted for risk.

Adjusting Returns for Risks

Since the portfolio returns to the owners of real capital and the returns to participants in a pay-as-you-go social security system are both subject to risk, it would be appropriate to evaluate the income loss of an unfunded system by considering the lower certainty equivalent values for both the real capital and the pay-as-you-go returns.

The certainty equivalent social rate of return on real capital depends on how the risk in that return is shared through the tax system between individual savers and the broader public.[27] Taxes paid by corporations have equaled about 42 percent of the 9.3 percent real pretax return over the past thirty-five years (Rippe 1995), implying a net 5.4 percent average return to savers before personal taxes[28] and a 3.9 percent return collected by the government. Variations in this source of government revenue are reflected in the short run in the budget deficit and, in the longer run, in changes in taxes on all incomes (most of which are employment incomes) and in government spending.

I believe that most individuals who have small amounts of financial assets do not invest in stocks and bonds because the costs of learning how to make such investments outweigh the incremental income that would result relative to the yield on bank deposits on their very limited financial assets. The very small variations in net income imposed on them through their sharing in the tax revenue derived from investment income can therefore be ignored, taking the mean value of that income as the certainty equivalent.[29] It is reasonable therefore to use the mean value (of 3.9 percent) as the relevant certainty equivalent for the part of the return to capital that is collected by the government.

What is the appropriate certainty equivalent for the 5.4 percent return that accrues to individual savers? A relatively conservative choice is the real yield on ten-year government bonds, a return of 2.5 percent between 1960 and 1994. Combining the 3.9 percent return collected in taxes and this 2.5 percent certainty equivalent return received by individuals gives a total certainty equivalent return of 6.4 percent instead of the expected return of 9.3 percent.

27. This issue is discussed in Feldstein (1995d). Arrow and Lind (1970) explain that the fundamental principle for the evaluation of risky public expenditures is that the value of benefits should be reduced if a substantial risk is borne by the individual but that the expected value is an appropriate certainty equivalent for the part of the benefits and costs that the government spreads to all taxpayers through the tax system.

28. I assume that the alternative to the unfunded program would be a funded program in which the individual saver would get a return net of the corporate tax but not subject to any personal taxes. If additional personal taxes were levied, the certainty equivalent would get even closer to the expected value.

29. This implicitly assumes that the variation in portfolio income is uncorrelated with shocks to their income and consumption.

It is less clear how the 2.6 percent return of the unfunded social security program should be adjusted for risk. The future return that individuals will receive on their social security taxes depends on the growth of aggregate real wages, on the changing age structure of the population, and on political decisions about taxes and benefits. During the period since 1960, the forward-looking increase in aggregate real wages for completed twenty-year periods varied from a low of 1.5 percent to a high of 3.0 percent. Changes in demographic structure added to the fluctuations in available returns. And, in recent years, the value of future social security benefits has been decreased by subjecting them to tax and by increasing the retirement age at which full benefits are paid.

One possibility would be to assume that the return on social security is as uncertain as the real return on investment in plant and equipment, suggesting that the appropriate difference between the two certainty equivalents may be the same as the difference between the two mean values, or 6.7 percent. An alternative extreme assumption would be to adjust the return on real capital for risk but to make no adjustment in the return on the social security program, implying a risk-adjusted difference of only 3.8 percent, that is, the difference between the 6.4 percent certainty equivalent yield on real capital and the 2.6 percent expected return on social security wealth. Note that even this low 3.8 percentage point difference in returns implies that substituting the existing $7 trillion unfunded social security wealth for a funded program of equal size implies a risk-adjusted income loss of nearly 4 percent of GDP.[30]

In short, while risk adjustment might change the specific magnitude of the annual loss, even with a very conservative risk adjustment, the loss of having a funded rather than an unfunded program remains very substantial.

Initial Gains and Subsequent Losses

I turn now to the issue of how to balance the gain to those generations of beneficiaries in an unfunded system who receive benefits without contributing a corresponding amount and the losses to all future generations who forgo the higher yield that would be earned on real capital.[31]

When a social security program first begins, the government collects an amount in taxes that it distributes to the then current retirees, if the program is unfunded, or that it invests in the national capital stock, if the program is to be funded. The same thing happens again whenever the tax rate is increased to

30. See n. 25 above. A $7 trillion increase in the 1995 capital stock would raise the capital stock by about 33 percent and, assuming a Cobb-Douglas technology with a capital coefficient of 0.25, would raise national income by 7.4 percent. Labor would receive about three-fourths of this increase. This calculation ignores the risk adjustment and the offset for the implicit pay-as-you-go return on social security wealth. A 2.6 percent pay-as-you-go return on social security wealth would be about 2.5 percent of GDP.

31. A more formal analysis of this issue is presented in the appendix.

finance a relative increase in benefits or an expansion of coverage. To simplify the current discussion, I ignore the role of subsequent expansions and consider only the windfall benefits to the initial generation.

If each dollar collected by an unfunded program reduces national saving, each generation after the initial one incurs a loss that reflects the difference between the marginal product of the displaced capital and the return on the unfunded program (i.e., the growth rate of aggregate wages). The key question is whether the present value of the losses to all future generations exceeds the windfall benefit that the initial generation received without having paid any tax.

To compare these magnitudes, the future losses must be discounted at a rate that reflects the rate at which the marginal utility of consumption declines over time. The dollar loss to each subsequent generation grows at the same rate as aggregate wages. Discounting this growing stream of losses at a constant discount rate is therefore equivalent to applying a growth-adjusted discount rate—that is, the difference between the discount rate and the growth rate—to a constant perpetual loss at the level incurred by the first generation of losers. Thus, the present value of the losses is equal to the amount of capital displaced by the initial transfer of taxes multiplied by the ratio of the reduced rate of return—that is, the difference between the risk-adjusted marginal product of capital and the risk-adjusted social security return—to the growth-adjusted discount rate.

To simplify this discussion, assume now that the unfunded program reduces national saving by a dollar for every dollar that it collects in taxes.[32] Since the initial generation receives a benefit equal to the initial amount of the tax, the adoption of an unfunded plan rather than a funded plan causes a net present value loss if the return difference per dollar of forgone investment exceeds the growth-adjusted discount rate. This condition is satisfied for any plausible values of the parameters, implying that the present value of the future losses exceeds the value of the initial transfer.

Consider the following example. If one adopts the very conservative procedure of risk adjusting the return to private capital but making no adjustment to the return on social security taxes, the lost rate of return is 3.8 percent. The present value of the future losses therefore exceeds the value of the initial generation's windfall if the growth-adjusted discount rate is less than 3.8 percent. Since the growth rate is 2.6 percent, this is satisfied if the real discount rate itself is less than 6.4 percent, a condition that is certainly warranted.

With a more plausible but still very conservative high discount rate of 4 percent,[33] the risk-adjusted annual loss of 3.8 percent of displaced investment

32. The assumption of one-for-one substitution simplifies by abstracting from income effects and individual myopia. Alternatively, the alternative to an unfunded program might be considered to be a funded program. The more general case of less than one-for-one substitution is discussed in the appendix.

33. The discount rate should reflect the decline in the marginal utility of per capita consumption that results from the growth of per capita real wages. With per capita real wage growth at about

implies a present value loss of an unfunded program that is nearly three times as large (when discounted back to the start of the program) as the windfall benefit to the initial retirees.[34]

The Potential Gain from Privatization

This framework for thinking about the cost implied by an unfunded program can be used to assess whether a gain in economic welfare could be achieved by shifting to a privatized system in which each employee has a retirement account into which the employee and/or the employer must make regular periodic contributions that are then invested in stocks and bonds. The government may recognize its obligations to existing retirees and employees at the time of privatization by depositing in these retirement accounts new government bonds equal to the present value of the benefits to which the individual is then entitled on the basis of past contributions to the unfunded system. Funds in these new retirement accounts can be used to purchase annuities, or withdrawn gradually when the individual reaches retirement age, or bequeathed to a spouse or other heirs.[35]

A skeptic might ask whether this "privatization" really accomplishes anything since it merely converts the existing unfunded social security obligations into explicit government debt with the same present value. That skepticism would be warranted in a static economy but is not appropriate when economic growth is continually enlarging the size of the social security liability. Shifting from an unfunded to a funded program is an application of the general principle that, when you discover that you are in a hole, the first thing to do is to stop digging. Shifting to a funded system eliminates the future losses associated with future increases in the size of social security wealth.

In the first year after the privatization of a pay-as-you-go system, there is no increase in the capital stock because the government would have to borrow all the mandatory saving to pay benefits to existing retirees. But, as time passes,

1.6 percent a year, the appropriate discount rate is less than the critical value of 6.4 percent if the elasticity of the marginal utility function is less than the extremely high value of 4. An elasticity of 2, e.g., which is high enough to imply that the marginal utility of consumption is halved about every forty-five years, corresponds to a discount rate of 3.2 percent. With aggregate wage growth of 2.6 percent, this implies a growth-adjusted discount rate of only 0.6 percent.

34. Recall that, to simplify the discussion, I have assumed that there was only one initial windfall. The actual loss reflects all subsequent program expansions as well.

A discount rate of 4 percent implies a growth-adjusted discount rate of 1.4 percent. The present value of the losses is thus (3.8/1.4 =) 2.7 times the initial transfer. With a more plausible discount rate of 3.2 percent, the corresponding loss would be 6.3 times the initial transfer. And, if the return to social security is given the same risk adjustment as the return to real capital, the loss becomes ([9.3 − 2.6]/0.6 =) 11.2 times the initial transfer.

35. An alternative to explicitly creating these "recognition bonds" is to provide future retirement benefits based on past contributions but to stop accruing any further entitlements to pay-as-you-go benefits. That is the approach developed in Feldstein and Samwick (chap. 6 in this volume).

the amount of net capital investment grows (because the mandatory saving rises with the number of employees and their average incomes), while the net social security debt that is explicitly recognized at privatization remains constant. As a result, the capital stock grows and, with it, the incremental income.[36]

The net effect in each year consists of two parts: a gain equal to the real risk-adjusted return on the increase in the capital stock and a loss of the implicit social security return on the taxes paid. As the incremental capital stock grows, the net effect shifts from negative to positive and then increases without limit. The magnitude of the gain depends on the form of the transition. In the long run, if the risk-adjusted return on capital is 6.4 percent, the implicit return on the unfunded social security 2.6 percent, and the appropriate consumption discount rate 4 percent, the present value gain is nearly equal to the current value of the unfunded program. Approximating the current value of the unfunded program by the social security wealth implies a potential present value gain of nearly $7 trillion.

It is hard to put such a large sum in perspective. It may help to note that, with the assumed discount rate and GDP growth rate, that present value gain from privatization is equivalent to 1.4 percent of GDP starting immediately and continuing in perpetuity. Although this way of scaling the magnitude of the benefit may be useful, when thinking about the political economy of reform, it is also worth bearing in mind that the potential gain from the one-time political act of shifting to a funded program has such an enormous positive present value.

This is just the gain from increasing real capital accumulation. In addition, the shift to a funded program would also reduce the deadweight losses that are now caused by a payroll tax that distorts labor supply and the form of compensation. Recall that this reduction in deadweight loss is the portion that cannot be obtained by redistributing the existing implicit return but depends on raising the rate of return on social security contributions from the rate of growth of wages to the real return on capital. This $68 billion deadweight loss for 1995 corresponds in the long run to an additional 1.0 percent of GDP.

Foreign Experience with Privatization

The five individual country chapters in part 1 of this volume show how very different countries have managed the transition from systems based on unfunded government programs to systems that depend primarily on individual funded accounts. It is clear that no two systems are identical, reflecting differences in starting conditions, demographic circumstances, and political oppor-

36. In the transition presented in Feldstein and Samwick (chap. 6 in this volume), the pay-as-you-go benefits decline over time as retired individuals are able to rely more on the mandatory savings that they had accumulated during their working years.

tunities. Despite these differences, however, there is a core of common structural features.

In order to compare the evolution of the different systems and the structure of the privatized programs, I asked the authors of each of the country papers to address a common set of questions. Each country paper therefore begins by describing the social security pension system before the reform. It then discusses the reasons that the change was made and the steps that were needed to make the shift politically possible. The main part of each country paper is a detailed description of the new system, dealing with such issues as whether participation is mandatory, the contribution rate and base, the nature of the fund management and selection of investment options, and the ways that benefits are paid. Careful attention is given to the transition to the new system and the way that employees and retirees are treated in the transition. Although some of the systems are relatively new, the authors also discuss the likely effects of the new system on saving and capital markets in their respective countries.

Privatization Issues for the United States

Part 2 of this volume contains five papers that explore issues that are relevant to the consideration of privatization in the United States. Feldstein and Samwick (chap. 6) examine alternative feasible transitions from the existing U.S. social security program to a system of funded individual accounts, calculating the changes in the age-specific contributions that would occur along the transition path if current tax rate or benefit schedules were preserved and no change was made in the government borrowing requirements. Kotlikoff (chap. 7) extends the Auerbach-Kotlkoff multiperiod overlapping generations model to study the general equilibrium effects on capital accumulation, wages, and welfare of alternative ways of financing the obligations to existing employees and retirees if the current system were replaced with voluntary funded contributions to individual accounts. Gustman and Steinmeier (chap. 8) focus on the retirement decisions and explore how alternative transitions rules would affect retirement behavior. Poterba and Wise (chap. 9) study the investment choices of employees with 401(k) and IRA accounts to assess how individual asset allocation decisions might be made in the accounts created by a privatized social security system. They also examine some of the issues associated with the choice between annuities and other methods of paying benefits over time. Finally, Mitchell (chap. 10) discusses the issue of administrative costs and the experience of U.S. and foreign fund managers and pension programs.

As I noted in the preface, the papers in this volume are part of an ongoing research program. The countries that are switching to privatized systems are still in the process of transition, and their problems and achievements merit continued study. Although the papers dealing with the issues that the United States would confront in considering a shift to individual accounts provide substantial new information, they also help focus on issues that are not yet

well enough understood. These are the subjects of NBER research currently under way.

Appendix
The Effect of Privatizing Social Security on Economic Welfare

This appendix presents a more formal analysis of the economic gains that result from shifting from an unfunded pay-as-you-go system of retirement benefits to a funded system.[37] The analysis clarifies the way that the welfare gain from privatization depends on the productivity of capital, the rate of growth of real wages, and the rate at which future consumption is discounted to the present. To simplify the analysis, I focus on the comparison of future consumption gains and current short-term consumption losses, ignoring the sizable deadweight losses associated with labor supply distortions that would be eliminated in the process of privatization.

The first section of this appendix reviews the simple analytics of replacing private saving with an unfunded social security system. The second section then builds on this to examine the potential gain from shifting from an unfunded system to a funded system, bearing in mind the obligations to existing retirees and employees. The analysis assumes that the shift to the funded system raises the national saving rate by the full amount of the taxes collected by the unfunded system, thereby substantially increasing the level of real benefits. The third section repeats the analysis of the second section with the alternative assumption that the funded system has a smaller contribution rate that is selected to provide the same level of benefits as the existing unfunded system.

There are a variety of possible mechanisms for dealing with the obligations to existing employees and retirees. The current analysis assumes that these obligations are converted to an explicit national debt (the so-called recognition bonds) that is then serviced in perpetuity. Alternative assumptions would implicitly involve different schedules for repaying the recognition debt without the formal creation of recognition bonds.

Surprisingly, there has been no explicit analysis of the conditions under which privatizing social security would increase economic welfare.[38] The po-

37. An earlier version of this appendix appeared as Feldstein (1995d).

38. 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., in which 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

tential ambiguity of the effect occurs because, while each future generation would benefit from earning the higher return on real 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.[39] 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 return on the incremental real saving.

The Welfare Loss of Introducing an Unfunded Social Security Program

Consider a simple overlapping generations (OLG) model with no social security program in which individuals live for two 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.

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,[40] the loss of income in retirement is $(\rho - \gamma)\theta w_0$. The present value of this loss to the individual at the time that the social security program is introduced is $(1 + \rho)^{-1}(\rho - \gamma)\theta w_0$.

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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 (1987b) presented an explicit formula for the welfare cost of social security's adverse effect on private saving similar to the analysis in the first section of this appendix. Feldstein (1985) derived the optimal level of benefits in an unfunded system and showed conditions under which that optimum would be zero. Feldstein (1995a) 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. Analyses by Auerbach and Kotlikoff (1987) and by Seidman (1983, 1986) have discussed the effects of reducing the benefits of existing retirees but not those of privatizing the existing system with benefits unchanged. Auerbach and Kotlikoff (1987) and Corsetti and Schmidt-Hebbel (1996) show that shifting to a funded system would raise welfare by reducing the distortions to labor supply caused by existing payroll taxes.

39. 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.

40. 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 introducing an unfunded program.

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,[41] the present value of the loss to employee participants of all generations (i.e., ignoring the gain to the initial generation of retirees) is

$$\text{(A1)} \qquad \text{PVL} = (1 + \rho)^{-1}(\rho - \gamma)T_0 \sum_0 [(1 + \gamma)^t/(1 + \delta)^t]$$
$$= [(1 + \delta)/(1 + \rho)][(\rho - \gamma)/(\delta - \gamma)]T_0,$$

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.[42] Note, however, that, if $\delta = \rho$, the loss to future retirees just balances the transfer to the initial retirees (PVL = T_0) regardless of the difference between ρ and γ. In 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_0, 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.[43]

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 (A1) 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

41. The appropriate rate for discounting consumption across generations is discussed on page 25.

42. The relation of ρ and γ is discussed on page 24. See also Feldstein (1965) and Abel et al. (1989).

43. Equation (A1) implies PVL > T_0 if $\gamma > -1$ and $\rho > \delta$. Since γ is the growth rate of aggregate real labor income, $\gamma > 0 > -1$.

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 consumption of retirees who would otherwise have saved "too little" for their own retirement.[44] Such myopic behavior would be precluded by the assumption that $\theta w_t < s_t$, that is, 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 (A1) 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.[45]

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 would be protected at least as much under a funded program as under an unfunded program.[46]

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. This appendix models that recognition as the explicit creation of additional national debt of equal value that is serviced in perpetuity.[47] Each future generation therefore bears a burden because of the additional national debt that must be balanced against the higher retirement income[48] 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

44. 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."

45. 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.

46. 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.

47. Feldstein and Samwick (chap. 6 in this volume) assume that the debt is not explicitly stated but that the retirees and existing employees receive the benefits that they have accumulated on the basis of past contributions to the unfunded program. No additional national debt remains after the last of these employees has died. This is equivalent to creating explicit national debt and amortizing it over the life of the youngest current employee.

48. The third section considers the alternative of lower pension contributions (instead of higher retirement benefits).

Table A.1 **Receipts and Payments of Overlapping Generations**

	t	$t+1$	$t+2$	$t+3$
Social security program and participants:				
Unfunded:				
Retirees (benefits)	$+T_t$	$+T_t(1+\gamma)$	$+T_t(1+\gamma)^2$	$+T_t(1+\gamma)^3$
Employees (taxes)	$-T_t$	$-T_t(1+\gamma)$	$-T_t(1+\gamma)^2$	$-T_t(1+\gamma)^3$
Net	0	0	0	0
Privatized:				
Retirees[a]	$+T_t$	$+T_t(1+\rho)$	$+T_t(1+\gamma)(1+\rho)$	$+T_t(1+\gamma)^2(1+\rho)$
Employees[b]	$-T_t$	$-T_t(1+\gamma)$	$-T_t(1+\gamma)^2$	$-T_t(1+\gamma)^3$
Debt	0	$-\rho T_t$	$-\rho T_t$	$-\rho T_t$
Net receipts	0	$-\gamma T_t$	$[(1+\gamma)(\rho-\gamma)-\rho]T_t$	$[(1+\gamma)^2(\rho-\gamma)-\rho]T_t$

[a]Under the privatized funded plan, retirees receive benefits at time t and then receive the principal and earnings on their savings for all $t > 0$.

[b]Under the privatize funded plan, employees save these amounts.

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 the first section, the privatization process that begins at time t is equivalent to reducing the payroll tax on the current generation of employees by T_t and issuing national debt of T_t. If that generation of employees increases saving by the amount of the tax reduction, this incremental saving is just enough to absorb the additional national debt.[49] The debt service during each period in the future is ρT_t.[50]

Table A.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, (mandatory) saving is by assumption the same as the employees would otherwise have paid in payroll taxes. Retirees continue to receive transfer funded benefits only in the first period of the transition (at time t) and then receive the income and principle from their private saving. In

49. Although the initial employees are required to save T_t in the mandatory private saving fund, they may reduce (or increase) other saving in response to the income effect of 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 it would alter the magnitude of the gain.

50. 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 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.

addition, the existence of the government debt reduces real income (by crowding out private capital) in each period by ρT_t.

Note that, at time t, 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 $T_t(1 + \rho)$, an improvement of $(\rho - \gamma)T_t$ in comparison to the unfunded system. But some combination of retirees and employees must also bear the cost of debt service ρT_t. The net effect of privatization on consumption at time $t + 1$ is therefore $-\gamma T_t$.

Table A.1 shows that, while the negative effect of debt service remains constant at $-\rho T_t$, 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 $(\sum_{s=1} [\rho - \gamma]T_t[1 + \gamma]^{s-1}[1 + \delta]^{-s})$ exceeds the present value of the debt service $(\sum_{s=1} \rho T_t[1 + \delta]^{-s})$. The present value gain from privatizing is

$$\text{(A2)} \qquad \text{PVG} = \sum_1 (\rho - \gamma)T_t(1 + \gamma)^{s-1}(1 + \delta)^{-t} - \sum_1 \rho T_t(1 + \delta)^{-s}$$

or, equivalently,

$$\text{(A3)} \qquad \text{PVG} = [(\rho - \gamma)/(\delta - \gamma) - \rho/\delta]T_t.$$

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 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 $(\rho - \gamma)T_t$, which, with $\gamma = 0$, is ρT_t, 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 time t 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 a 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.

Parameter Values and the Estimated Net Gain

The values associated with the three key parameters (γ, ρ, and δ) that were discussed in the text of this introductory chapter imply the critical inequalities ($\rho > \delta$ and $\delta > \gamma > 0$) and provide the basis for calculating a theoretical estimate of the net gain from privatizing social security. More specifically, the experience in the United States since 1960 implies $\gamma = 0.026$ and $\rho = 0.093$. The text suggests that the certainty equivalent rate of return that replaces the return to portfolio investors with the yield on government bonds is 6.4 percent, which will be denoted $\rho^* = 0.064$. Finally, the corresponding certainty equivalent for the return on the unfunded program will be written γ^*. If the risk of the social security program is ignored, $\gamma^* = \gamma = 0.026$, while, if social security is deemed to be as risky as portfolio investments, $\rho^* - \gamma^* = \rho - \gamma = 0.093 - 0.026 = 0.067$.

The derivation of equation (A3) for the present value gain from privatizing social security implies that

$$\text{(A4)} \qquad \text{PVG} = [(\rho^* - \gamma^*)/(\delta - \gamma) - \rho^*/\delta]T_0.$$

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 the effect of the economy's growth on the future size of the program and therefore is not a rate of return subject to a certainty equivalence adjustment.

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 (A1), (A2), and (A3) do not exist; the loss of income of an unfunded social security program $(\rho^* - \gamma^*)T_t(1 + \gamma)^s$ grows faster than the discount factor. But, 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. The common assumption of an additive separable constant elasticity utility function implies that $\delta = (\gamma - n)\eta$, where $\gamma - n$ is the rate of increase of per capita incomes, and η is the absolute elasticity of marginal utility.[51]

Between 1960 and 1994, the population growth rate was $n = 0.011$, implying $\gamma - n = 0.015$. Plausible values of the elasticity of the marginal utility function are generally taken to be about $\eta = 2$, 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 to a funded social security program. Values of $\eta < 1.7$ 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 $\eta > 4.2$ would imply $\delta > \rho^* = 0.064$ and therefore a net loss from a debt-financed shift to a funded system.

Effect of Constant Benefits and Reduced Taxes

The calculations in the second and third sections may be regarded as unrealistic because they assume that the mandatory saving in a funded system would be as large as the contributions to the unfunded system. That may not occur because it would imply a much higher level of retirement income with no increase in net income during working years. An alternative "extreme" assump-

51. Let the social welfare function be $\sum u(c_t)$, where c_t is mean per capita consumption at time t and $u(c_t) = kc_t^{\eta+1}$. Then $1 + \delta = \text{MRS}(c_t, c_{t+1}) = (1 + \gamma - n)^{\eta} \cong 1 + (\gamma - n)\eta$.

tion is that contributions in the funded program are set to produce the same benefits as in the current unfunded system.

With this assumption, each generation of employees saves the fraction $(1 + \gamma)/(1 + \rho)$ times what it would pay as payroll tax with an unfunded system. This implies that the analogue to equation (A3) is

$$\text{(A5)} \qquad \text{PVG} = \{[(1 + \delta)/(1 + \rho^*)][(\rho^* - \gamma^*)/(\delta - \gamma)] - \rho^*/\delta\}T_t.$$

The difference is that the gross gain (before taking into account the debt service cost) is reduced by a factor of $(1 + \delta)/(1 + \rho^*)$, reflecting the fact that, with the smaller saving, the gain is reduced. If individuals were permitted to supplement mandatory saving and earn the return ρ^*, this reduction could be eliminated.

Other variations on the basic theme could be considered, including debt amortization instead of a perpetual increase in the debt. These have consequences for the intergenerational distribution as well as for the net present value gain.

Rather than consider more such possibilities in this simplified theoretical framework, it is better to study them with actual parameter values (as in Feldstein and Samwick, chap. 6 in this volume). But the current analysis has been sufficient to indicate why gains occur and how, in a qualitative sense, they are related to the rates of growth of wages, the productivity of capital, and the rate of consumption discount.

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