Social Security: How Social and Secure Should It Be?

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How will we support ourselves when we grow old? The question is timeless, for age brings a loss of strength, agility, health, and acuity and no one, in any time, can calmly rely on his or her continuing ability to earn a living when old.

In the United States, and in other industrial nations, we have come to rely on the government to solve much of the old-age income problem. Public programs today promise a basic pension, health care, and tax-sheltered programs for transferring income to our retirement years. But these programs face serious difficulties in the century ahead.

Experts of different economic and political persuasions concur that government commitments to the elderly will be a significant economic burden in the coming century. But they disagree on the severity of the problem and on how best to proceed. As a result, proposals for change range all over the map. The purpose of this paper is to document the nature of the problem and to explore some of the fundamental issues that must be addressed in devising a viable response.

The paper opens with a brief overview of the goals of the social insurance system. We then review how demographics will produce a worsening old-age dependency problem in coming decades and how this will result in a fiscal crisis if current policies continue. Although we focus on Social Security (that is, on public old-age pensions), we also examine the role other programs are expected to play in the worsening fiscal

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situation. Following this discussion, we examine two basic reform proposals—whether Social Security should be moved toward a pre-funded basis, and whether Social Security should maintain its defined-benefit structure or move toward a defined-contribution format.

Complicating the discussion of these issues is uncertainty about how potential reforms would affect factors such as national saving, labor force participation, financial markets, and the allocation of investment. These questions are addressed by the authors of the other papers in this volume.

Goals of the Social Security Program

The current goals of the nation's social insurance system were largely defined in the decade from 1965 to 1974, at the end of the long prosperity following the Second World War. The federal government then boldly expanded its old-age income ambitions. It created Medicare in 1965; it raised Social Security benefits sharply between 1968 and 1972; and it enacted the Employee Retirement Income Security Act (ERISA) in 1974, to make the publicly subsidized private pension institution a secure and broad-based source of old-age income.

This expansion significantly improved the lives of older Americans. Medicare tamed the primary financial risk the elderly face: uncertain health care costs. Private pension programs, including the increasingly popular "defined-contribution" arrangements, have emerged as a central fixture in the national system of old-age income provision for middle-income and upper-income households. Social Security, the focus of this conference, sharply raised the minimum standard of living of the nation's elderly, and especially the poorer half of that population. As Figure 1 shows, Social Security benefits today are the mainstay of older Americans, providing more than half the cash income of more than half of all elderly households.

A primary goal of the U.S. social insurance system, like all such systems, is to keep the elderly out of poverty. So, as Figure 2 shows, Social Security replaces significantly more of a low-wage worker's earnings.[1]

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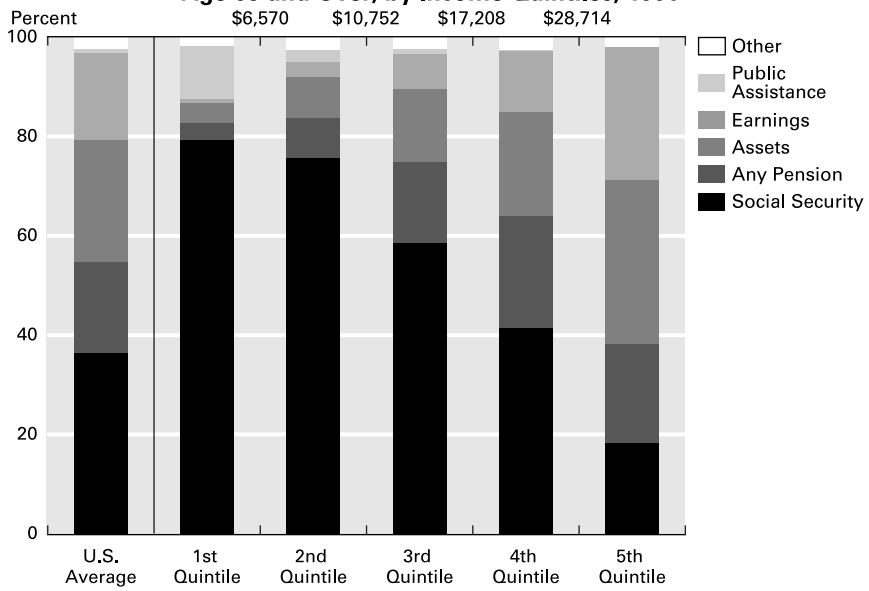
[1] Figure 2, taken from Myers (1993), shows both "gross" and "net" replacement rates. The gross rate gives a worker's Social Security benefit as a percentage of his or her earnings immediately prior to retirement. (To calculate the benefit, Myers assumes the worker's earnings had moved through time in line with general wage trends.) The "net" replacement rate gives a worker's Social Security benefit as a percentage of his or her "net take-home pay" immediately prior to retirement. (Myers estimates "net take-home pay" by subtracting from preretirement earnings estimated work expenses plus federal, state, and Social Security taxes due on earnings, but not on Social Security benefits.)

Social Security's reduction of poverty among the elderly did not involve as much of a redistribution of "net Social Security wealth" as suggested by comparing the replacement rates of high-income and low-income workers. This is because high-income workers typically start their careers later and live longer than low-income workers.

Figure 1
Shares of Aggregate Household Income of the Elderly, Age 65 and Over, by Income Quintiles, 1990

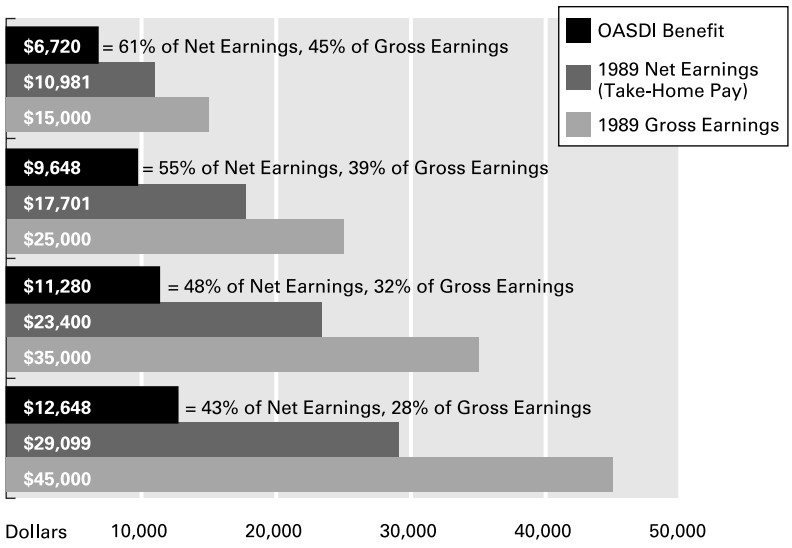


Note: Figures at top are the income levels that separate the five income quintiles.
Source: Grad (1992).

U.S. allowances are not especially generous by international standards. But economic growth and increases in the replacement rate for low-wage workers (Figure 3) increased the value of Social Security benefits accruing to retirees in the late 1960s and early 1970s, and contributed to a drop in the poverty rate among the elderly from 29 to 15 percent between 1966 and 1975 (Figure 4). Because economic well-being is often viewed as a relative concept, pension systems, both public and private, peg benefits to a worker's earnings at or near the time of retirement. The Social Security amendments of 1972 did so explicitly—indexing a worker's accruing credits to wage growth, and a retiree's pension benefit to prices—so workers could expect to maintain a minimum standard of decency within the economic commonwealth.

What has now been called into question is the government's ability to maintain this expanded notion of Social Security—Medicare and Medicaid, richly subsidized private pensions, and a guarantee of an adequate cash income. As Figure 4 shows, the poverty rate for the elderly is now less than that for the overall population, and well below the rate for children. Many think that this indicates a need to reallocate federal

Figure 2
Examples of Replacement Rates for Single Persons Retiring at Age 65 in Early 1990



Note: The chart shows estimates of net and gross OASDI replacement rates for four levels of 1989 earnings. Net earnings (take-home pay) is gross earnings less federal and state income taxes, Social Security taxes, and work expenses.
Source: Myers (1993).

spending toward programs designed to increase the welfare of children in low-income families. Demographic trends, however, are pushing toward even larger government transfers to the aged.

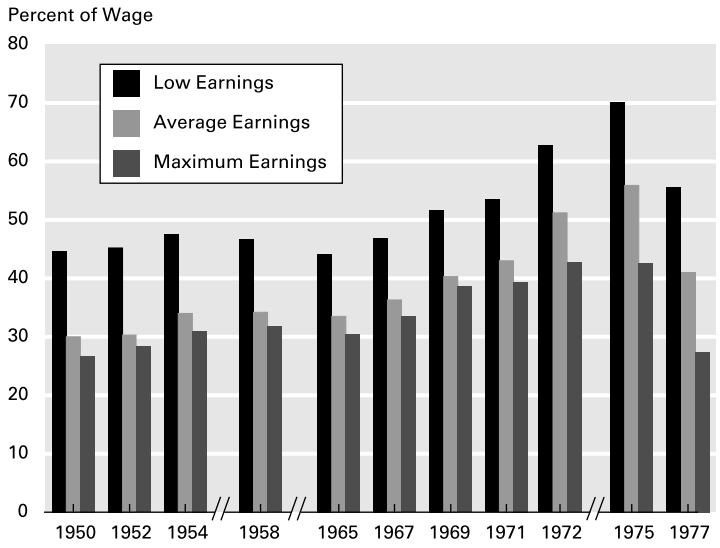
The Problem

As is widely understood, the transition to a demographic structure with low fertility and long life expectancy will place tremendous strain on Social Security and other programs that serve the aged. As the nation makes the transition, the tax base that funds Social Security, labor earnings, will grow more slowly than it had in the past. But for several decades, there will be no commensurate slowing in the growth in benefit obligations.

The Demographic Transition

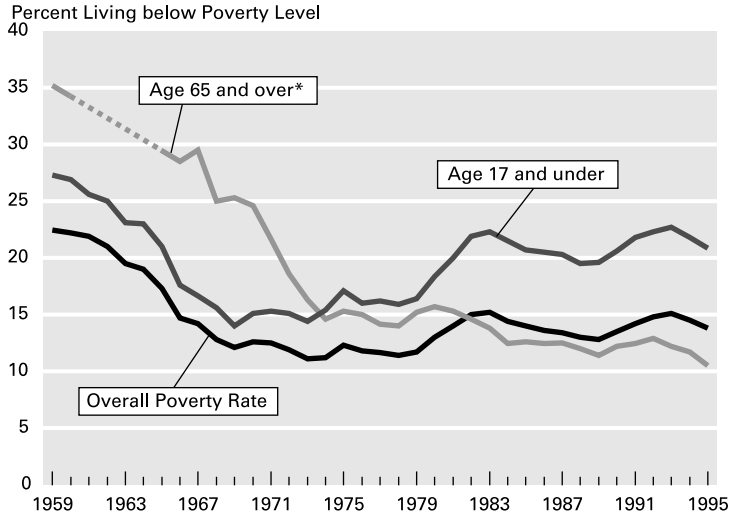
As Figure 5 shows, the U.S. fertility rate has dropped sharply over time. The birth of the baby boomers following World War II was an

Figure 3
Replacement Rates for Single, Steady Workers Retiring at Normal Retirement Age in Years When Social Security Amendments Were Adopted



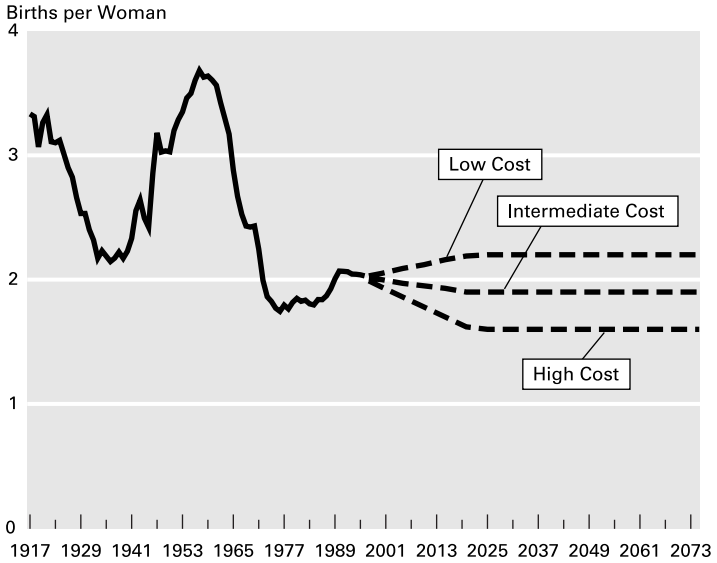
1977: present law
Source: Myers (1993).

Figure 4
Trends in Official Poverty Rates



* Data are unavailable for the period 1960 to 1965 for ages 65 and over. Interpolated values are shown for these years.
Source: U.S. Bureau of the Census, 1992, *Poverty in the United States: 1991,* Current Population Reports, Series P-60, No. 181.

Figure 5
U.S. Fertility Rate



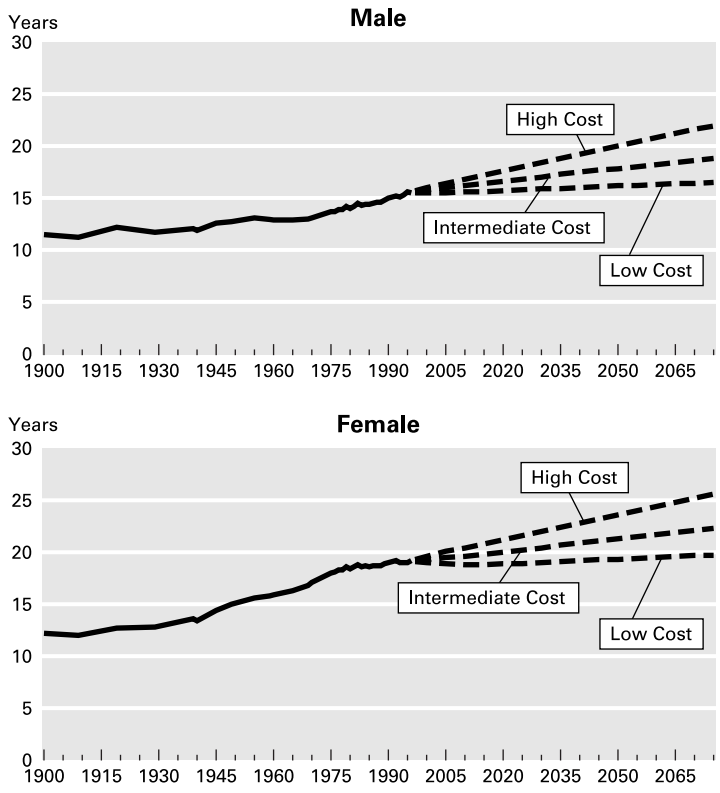
Source: Historical data (1917-1996): National Center for Health Statistics; projected data (1997-2075): 1997 Trustees' Report of the OASDI Trust Fund.

aberration in this long-term trend; it produced a spurt in the growth of the working-age population, as the baby boomers entered adulthood in the mid 1960s through the mid 1980s, followed by a sharp deceleration. In addition to the historical data, Figure 5 shows fertility rates forecast by the Social Security Administration (SSA 1997) under their low-cost, intermediate, and high-cost scenarios. While the range of fertility rates considered by the SSA reflects uncertainty regarding what future fertility rates will actually be, even the highest estimates (the low-cost forecast) are barely above the level needed to stabilize the size of future birth cohorts.[2]

The long-run decline in the fertility rate has been accompanied by an increase in life expectancy. Figure 6 displays life expectancy at age 65 for men and women both for the recent past and for the future as forecast by the SSA. As with fertility, the life-expectancy forecasts reflect consider-

[2] The Technical Panel on Assumptions and Methods of the 1994–1996 Advisory Council on Social Security (Advisory Council on Social Security 1997b) recommended that the intermediate estimate of the long-run fertility rate be increased from 1.9 to 1.95, and also suggested that an assumed increase in the fertility rate be incorporated into the short-run forecast.

Figure 6
U.S. Life Expectancy at Age 65



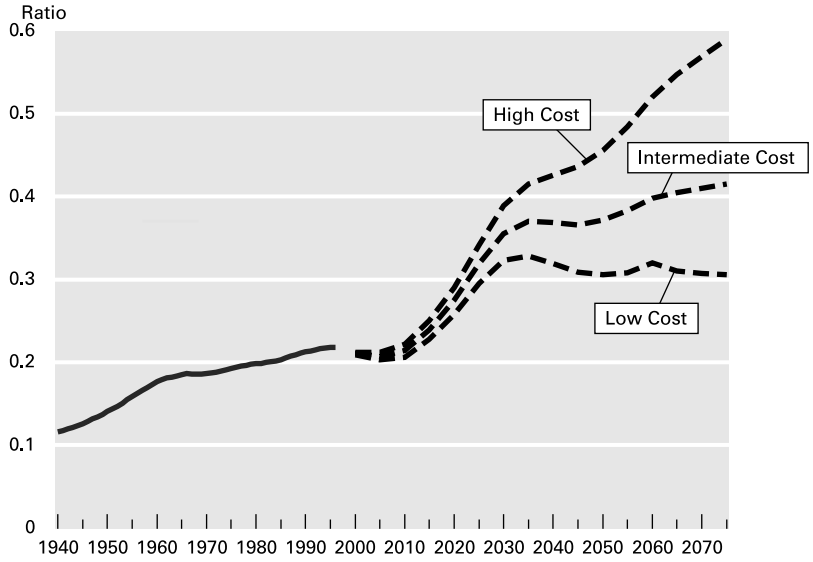
Source: Historical data (1900-1996): National Center for Health Statistics; projected data (1997-2075): 1997 Trustees' Report of the OASDI Trust Fund.

able uncertainty about what the future holds. But all three SSA scenarios forecast an increase in life expectancy.[3]

The low projected fertility rates, coupled with the projected increase in life expectancy, form the key factor underlying the projected increase in the aged dependency ratio—the ratio of the population age 65 or over

[3] The Technical Panel on Assumptions and Methods (Advisory Council on Social Security 1997b) noted that the intermediate forecast assumes that mortality improvement in the future will proceed at a slower rate than in the past, and suggested that this forecast be revised to reflect mortality decreases continuing at the rate experienced over the past century. In a recent paper, Lee and Tuljapurkar (1997) also argue that life expectancy is likely to increase faster than assumed in the SSA intermediate forecast.

Figure 7
Old-Age Dependency Ratio



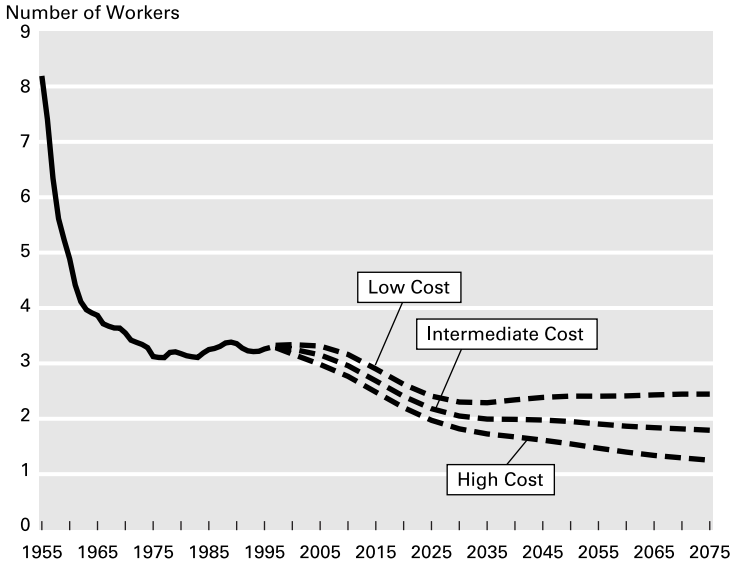
Note: The old-age dependency ratio is the population age 65 and over divided by the population age 20 to 64.
Source: Historical data (1940-1996): U.S. Bureau of the Census; projected data (2000-2075): 1997 Trustees' Report of the OASDI Trust Fund.

to the working-age population (ages 20 to 64). Although this ratio is relatively low today (0.21), it will increase rapidly as members of the baby boom generation turn 65 (Figure 7). According to the SSA's intermediate forecast, the aged dependency ratio will reach 0.35 by 2030 and continue increasing beyond that point at a slower rate. Since the labor force participation rate is not expected to increase, this implies a decrease in the ratio of the number of workers paying Social Security payroll taxes to the number of people collecting benefits. While there are currently 3.3 workers per beneficiary, the SSA intermediate forecast projects only 2 workers per beneficiary in 2030. More ominous, the high-cost forecast projects only 1.3 workers per beneficiary by 2065 (Figure 8).

The Looming Fiscal Crisis

The increase in the aged dependency ratio has troubling implications for the distribution of economic resources and the fiscal solvency of the U.S. government. Government transfer programs benefiting the elderly, especially Social Security, Medicare, and Medicaid, will claim an increasing share of national output and strain the government's fiscal capacity.

Figure 8
Covered Workers Per OASDI Beneficiary



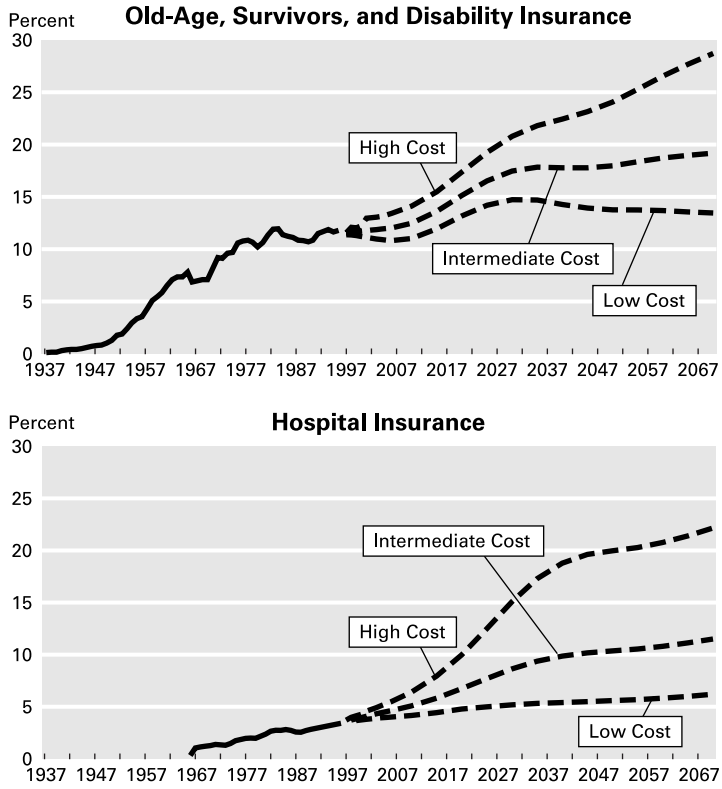
Note: In 1940, there were 159 covered workers per OASDI beneficiary. This ratio fell quickly to 94 by the next year, to 36 by 1945, to 13 by 1950, and to 8 by 1955.

Source: Historical data (1940-1996): *Social Security Bulletin, Annual Statistical Supplement;* projected data (1996-2075): 1997 Trustees' Report of the OASDI Trust Fund.

The coming retirement of the baby boom generation will initiate this major drain on the system. But even after the baby boomers have passed from the scene, the combination of slow labor force growth and increased life expectancy will put continuing pressure on the economy and on the finances of the nation's social insurance system.

Since payroll taxation funds both the Old Age, Survivors, and Disability Insurance (OASDI) and Medicare Hospital Insurance (HI) programs, it is instructive to examine the projected expenditures for these programs expressed as a percent of taxable payroll. These forecasts, displayed in Figure 9, show the payroll tax rates that would be needed to fund the programs on a pay-as-you-go basis. Under the intermediate cost assumptions, OASDI expenditures would increase from the current 11.5 percent of taxable payroll to 19.2 percent in 2070, and Medicare HI expenditures would increase from 3.6 to 11.5 percent of taxable payroll. For the two programs combined, expenditures in 2070 are forecast to be over 30 percent of taxable payroll. Even more alarming is the projected increase under the high-cost assumptions: OASDI expenditures would reach 28.7 percent of taxable payroll in 2070, and Medicare HI expendi-

Figure 9
Projected OASDI and HI Expenditures as a Percentage of Taxable Payroll



Source: Historical data (1937-1996): *Social Security Bulletin, Annual Statistical Supplement;* projected data (1997-2070): 1997 Trustees' Report of the OASDI Trust Fund.

tures would reach 22.2 percent. Combined expenditures on these two programs would exceed 50 percent of taxable payroll. Adding the cost of Supplementary Medicare Insurance and the portions of Medicaid and Supplementary Security Income that accrue to the elderly further increases the projected burden of funding federal programs for the aged.

Consequences of the Fiscal Crisis

The payroll tax rates that would be required to fund these programs on a pay-as-you-go basis clearly are alarming. Such high marginal tax rates would entail a substantial efficiency cost, for the deadweight loss of taxation increases with the square of the marginal tax rate. As Feldstein

(1996) stresses, the deadweight loss of the Social Security payroll tax depends not only on the payroll tax itself, but on the total marginal tax rate created by the payroll tax in combination with other taxes on earnings.

The projected payroll tax rates required under a pay-as-you-go system are alarming for a second reason. The levies highlight the need to divert an increasing share of national output to the elderly as the aged dependency ratio increases; even if Social Security and Medicare ceased to exist, we would need a mechanism to transfer a larger share of current output to retirees. But to pay for these programs on a pay-as-you-go basis could be very detrimental to the welfare of future generations.

The projected economic burden of providing for the elderly has led to calls for reform of the nation's social insurance system. Many of the proposals would increase Social Security funding levels so that current workers contribute more to support their own retirement. A second feature of many of the proposals would reduce the efficiency loss resulting from the projected high marginal tax rates by getting workers to treat social insurance payments as a contribution toward retirement savings rather than as a tax. Because the value of Social Security pension benefits is linked to past earnings, while Medicare benefits are not, it is easier to devise a privatized saving scheme that transforms the Social Security payroll tax into what workers might regard as a contribution toward their own retirement benefits. So even though Social Security plays a smaller role in the pending fiscal crisis than federal medical programs, it has received the bulk of the attention regarding possible privatization.

We now turn to the first of these two issues—increased funding of future Social Security benefits.

FUNDING

Discussions of funding are complicated by the fact that policy analysts differ in the way they view the concept. All agree that funding involves contributions to a fund or account, the income or assets of which will be used to finance future retirement benefits. But some analysts have in mind the traditional goal of funding—to put Social Security into long-run actuarial balance. Others think of funding in the sense of matching all current plan obligations with assets held in that fund or account.

Two Views of Funding

The first notion of funding begins with the problem of actuarial balance and fiscal integrity in a social insurance program. The social insurance actuary deems a system to be in balance if the projected income

(payroll tax receipts plus trust-fund income) is sufficient to fund the system's projected outlays. If the payroll tax alone could satisfy promised outlays ad infinitum, the social insurance actuary would be satisfied without any funding operation. Only if the current mix of future taxes and future investment income were insufficient would the actuary call for increased funding, or increased contributions into the plan's trust fund (Myers 1993).

The second notion of funding grows out of the private pension context. The private pension actuary asks whether the trust fund assets—the fruit of pension plan saving and investment—are sufficient to satisfy the plan's accrued obligations. If so, future generations would not be required to contribute anything to satisfy the existing retirement income claims of current or prior generations. If the social insurance system were fully funded in a private-pension sense, current trust fund assets alone could satisfy the accrued claims of all plan participants. From a third perspective—that of the economist—this approach has the advantage of basing future outlays entirely on actual saving and investment, which increase economic output, and not on the imposition of taxes, which tend to lower economic output.

Funding in Historical Perspective

A popular misconception is that Social Security's traditional funding program was strictly pay-as-you-go, paying current benefit obligations out of current payroll tax revenues. The initial Social Security Act of 1935 in fact called for a substantial partial-funding effort. Congress scheduled taxes above benefit outlays in the near term (when outlays were small, because of the system's immaturity), and would use the excess to build up the Social Security trust fund. Congress has always required the Social Security system to purchase Treasury securities, so funding meant increasing payroll taxes today to purchase claims on general tax receipts tomorrow. Under the 1935 Act, income generated by these Treasury bonds was expected to satisfy, in time, about 35 percent of the system's obligations.

The 1939 Amendments sharply lowered, but did not eliminate, these funding ambitions. Between 1939 and 1972—Social Security's commonly accepted age of "normalcy"—trust fund income was expected to provide, in time, about 15 percent of outlays. As Figure 10 shows, the Social Security program was in rough actuarial balance through 1972, with projected tax revenue and income from the trust fund in the "ultimate" equilibrium years sufficient to keep the system solvent. Throughout this period, the payroll tax rate was scheduled to increase in the future. As Figure 11 and Table 1 show, the future tax increases were expected to eventually produce large trust fund balances, the income from which would play an important role in financing benefits. For example, while

Figure 10
Actuarial Balance of OASDI Program

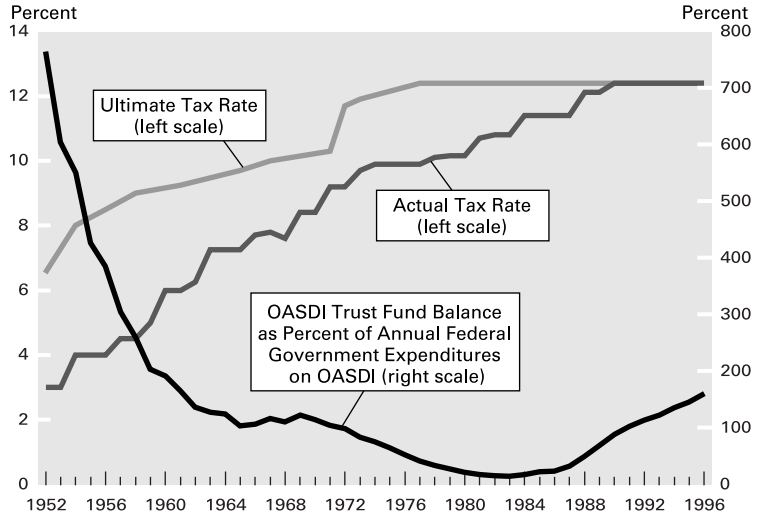
Source: Myers (1993, Table 10.17).

the actual payroll tax rate (combined employer plus employee rates) was 6 percent in 1960, the "ultimate" tax rate in the Social Security legislation applicable that year was 9 percent (scheduled to be adopted in 1969). The trust fund was expected to eventually increase to over eight times expenditures in the "ultimate" or equilibrium year 2025. A pattern of repeated benefit liberalizations and delays in enacting scheduled tax increases, however, kept the contribution of trust fund income well below target levels (Myers 1993).

Congress did adopt a straight pay-as-you-go policy in 1972, a year when it significantly liberalized benefits. Proponents of this shift in financial policy noted that the system had essentially operated on a pay-as-you-go basis. They could also argue that the payroll tax had hitherto been a remarkably successful source of funds (Myers 1993).

Pension plan assets are typically evaluated along three yardsticks—yield, risk, and hedge value. Up to 1972, the system's claim on future labor income—call it the Social Security "wage-tax bond"—scored high on each. As for yield, Aaron, Bosworth, and Burtless (1989) have shown that the cash flow thrown off by the wage-tax bond rose at a very respectable 4.5 percent per annum (real) over the postwar period. (Revenues rise with the growth of the wage base—roughly wage growth plus labor-force growth—and wages and the labor force both had been

Figure 11
Funding of the OASDI Trust Fund Over Time – Ultimate Tax Rate, Actual Tax Rate, and Trust Fund Balance



Source: Myers (1993).

rising at more than 2 percent per annum.) The revenue stream is also relatively riskless in that the payroll tax is a tax, so the funds will be collected. What is at risk are the sums to be raised. But here the wage-tax bond has an element of hedge value. Both tax receipts and benefit obligations are pegged to wages and the size of the labor force, so they tend to rise and fall in tandem. The lagged response of benefit obligations versus the immediate response of tax receipts sharply limits the value of

Table 1
Ultimate Trust Fund Figures, Selected Years

Year of Law	1935	1951	1960	1970	1983	1987	1992
Ultimate Year	1980	2000	2025	2025			
Ultimate Trust Fund Balance as a Multiple of Expenditures	13.04	6.90	8.61	2.36			
Year of Maximum Fund Ratio					2015	2015	2015
Maximum Fund Ratio					5.44	5.45	3.34
Year of Exhaustion					2063	2051	2036

Source: Myers (1993); *Social Security Bulletin, Annual Statistical Supplement, 1991.*

the hedge, however, and this is especially so for shifts in labor force growth (Aaron, Bosworth, and Burtless 1989).[4]

The Congress's flirtation with pay-as-you-go financing did not survive the decade of the 1970s. Congress stepped up funding in 1977, in response to the "notch" mistake and a cash-flow problem, and again in 1983, in recognition of the nation's demographic transition and the prospect of enormously high payroll taxes. The Social Security amendments of 1977 and 1983 scheduled payroll tax and benefit changes that would lead to a substantial buildup of the Social Security trust fund. The 1983 program did result in the restoration of solvency over the 75-year forecast horizon. However, the system was projected to be running a deficit toward the end of the 75-year period. So it was nearly inevitable that over time, as the 75-year forecast period extended further into the twenty-first century, actuarial balance would again be lost.

The program is currently still in its funding mode, and OASDI income in 1996 exceeded expenditures by $70 billion (over half in Treasury bond interest). The trust fund, as a result, is building up a substantial balance. Under the intermediate cost assumptions, payroll tax revenue will exceed outlays through 2011. Payroll tax revenue plus interest income from the trust fund will be sufficient to fund benefits through 2018. (Note, however, that the Social Security program already is depleting the federal government's overall fiscal position during this period since interest income is being transferred from government accounts.) After 2019, the system must draw down the trust fund's principal to continue benefit payments; in 2029, the trust fund will be exhausted. Unless the law is changed, the system would presumably then proceed on a pay-as-you-go basis.[5]

An alternative to this scenario, and a reversion to pay-as-you-go financing in 2029, would be to increase the payroll tax rate today by an amount sufficient to put the system in long-term actuarial balance. According to Alan Auerbach's estimates (Auerbach 1997), an immediate

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[4] Social Security revenues are roughly a linear function of the wage base, so revenue growth closely follows the "Samuelson rule" (Samuelson 1958) and approximates the sum of wage growth plus labor force growth. Liability growth is not a simple function of wage-base growth. Changes in factors such as household structure, earnings inequality, and inflation, for example, significantly influence liability growth. Most critical, however, are dynamic demographic factors that translate shifts in labor-force growth into shifts in the critical old-age dependency ratio. For simulations on the sensitivity of Social Security's financial balance to shifts in various dynamic factors, see Aaron, Bosworth, and Burtless (1989).

[5] Under the high-cost assumptions the trust fund is projected to be exhausted much earlier, while under the low-cost assumptions the trust fund will remain solvent throughout the forecast period (through 2075). According to the intermediate estimate, the payroll tax can fund only 70 percent of benefit promises by the year 2070.

3.25-percentage-point increase in the payroll tax is needed to return the system to actuarial balance, under the intermediate cost assumptions.[6]

Funding and Economic Growth

Partial funding of the Social Security system has traditionally been seen primarily as a device to assure the long-term solvency of the program. But especially in the 1980s, as the magnitude of the looming old-age income problem grew clear, the policy also came to be seen as a means of increasing economic growth. Only if the economic pie would expand significantly, the argument went, would there be enough output in the future to satisfy the consumption expectations of both active and retired workers.

Funding the Social Security system can increase the rate of economic growth by raising the level of saving and investment. Setting a payroll tax that raises more revenue than the system pays out in benefits cuts the amount of output that workers and retirees collectively consume. The purchase of government bonds by the Social Security trust fund then frees up private funds—funds that otherwise would be used to purchase these bonds—for investments that build up the nation's capital stock. And the reduction in consumption, created by the payroll tax increase, frees up the resources needed to produce these investment goods.[7]

For a Social Security funding program to increase national saving and investment, and thereby increase future output, the effort must not be offset by decreased saving by other governmental units, households, or corporations. If federal policymakers set fiscal policy with an eye toward achieving a particular path for the unified federal budget deficit (and accept the current accounting, which views Social Security as currently running a surplus), they could readily offset the increased funding of the Social Security program with increased deficits elsewhere in the federal budget. Many argue that the current trust fund buildup has been

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[6] Auerbach's (1997) estimate is of the tax increase that would allow the system to continue in actuarial balance in perpetuity. The Social Security Administration (Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Trust Funds, 1997) has calculated that a 2.26 percentage point increase in the payroll tax would keep OASDI in close actuarial balance through 2070.

[7] Cutler, Poterba, Sheiner, and Summers (1990) point out that the demographic transition in itself is not necessarily a reason for increasing national saving. The decrease in the birth rate, a key feature of the demographic transition, means the nation does not have to invest so much on children; it does not have to spend so much on feeding, clothing, sheltering, educating, and providing capital equipment for the next generation to make its way in the world. However, many economists and policy analysts believe the saving rate has fallen much more than would be warranted by these considerations and that public policy should be directed toward increasing national saving. Social Security reform is one possible policy instrument to use in increasing national saving.

sterilized precisely in this way.[8] Engen and Gale (this volume) examine the likely effect of Social Security reforms on national saving.

If increasing the national saving rate were the only reason to fund Social Security, we might very well find better ways to accomplish our goal. The government, for example, could balance its budget (or run a surplus) or deploy incentives to increase private saving. A commonly accepted reason to increase national saving through the Social Security program, however, grows out of the widely held belief that Social Security should be a self-supporting system, and thus should build up a fund today to cover its shortfall tomorrow.[9] Funding Social Security with a level payroll tax through time would also minimize the distortions the levy generates in the labor market. In this way as well, funding should increase economic output in the long run.

Funding and Investment Choice

A funding program that would return the Social Security system to actuarial balance would require a payroll tax increase of 3.25 percentage points. This figure, however, is calculated based on the assumption that the trust fund invests only in government securities. Various reform proposals would shift the assets used to fund social insurance programs from public to private securities, and especially to corporate equities. The primary reason is clear. Stocks have delivered significantly higher returns than either Treasuries or the wage-tax bond over any extended period ending in the present. With a projected yield in real terms of 2.3 percent, government securities have the lowest expected long-term rate of return available in the financial marketplace, well below that on private capital. An accumulation of Treasury bonds thus shaves relatively little off the long-term payroll tax rate. Bosworth (1996) notes that restricting the trust fund to holding government securities gives Social Security insufficient credit for the increase in the capital stock and the rise in national output that result from the buildup of the trust fund. Bohn (this volume)

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[8] The use of Treasury bonds as a Social Security saving vehicle is similar to the use of balance-sheet reserves in employer pension plans. Such reserves had a brief vogue in the U.S. private plans in the 1920s and are currently used to fund private plans in Germany. In both instances, if the sponsor's "purchase" of its own securities (or a similar indication of liability on its balance sheet) does *not* result in an increase in the total amount of debt outstanding, so that the amount of debt held by the public falls during the "funding" operation, saving by the sponsor would rise in the appropriate fashion.

[9] That Social Security should be a self-supporting system is a goal neither enshrined in law nor consistently applied. The original designers of the system and various Social Security advisory councils envisioned future contributions from general government revenues. The current funding of Medicare part B and the rebating of income taxes on the benefits of high-income taxpayers to the Social Security system violate this self-funding principle. Nevertheless, Social Security is generally self-supporting, and all three factions of the Advisory Council endorsed this principle (Myers 1993; Advisory Council 1997a).

examines the difficult questions regarding how a policy of using risky investments in the social insurance system would affect financial markets and the intergenerational distribution of risk-bearing.

A second motivation for broadening investment choice is to increase the likelihood that a Social Security funding program will indeed increase national saving. Under current law, the Social Security trust fund can hold only federal government securities. So when payroll taxes exceed benefit outlays and the trust fund buys additional securities, the government's need to sell debt to the public declines. This presumably makes it easier for the government to expand its operating deficit, diminishing the effect of the funding program on national saving. Allowing the trust fund to invest in private securities, however, could strengthen the link between federal operating deficits and the government's ability to issue debt. This should result in a more disciplined federal budgeting process.[10]

Social Security equity investments, however, raise the problem of government involvement in corporate governance. If the Social Security Administration holds equities in its trust fund, what it buys, and how it exercises its voting rights, are likely to become perennial political issues.

Funding's Political Effects

A Social Security funding program designed to produce level tax rates through time has two important political effects. First, it can claim to provide intergenerational insurance and to improve intergenerational equity. Resetting the tax schedule in response to economic and demographic shifts would establish a mechanism to pool differences in intergenerational experience—an important economic advantage. A level-tax program also sees that each generation in the pool faces the same tax rate and collects from the same schedule of benefits. Ignoring the "windfall" given to generations that entered the Social Security program at the beginning, and the potential beneficial effects of rising longevity on future generations, there would be no "lucky" (or "unlucky") generations.

A second beneficial effect of a level-tax program—if the level tax were taken as the program's annual cost—could be better Social Security accounting. Benefit outlays are currently taken as the program's cost, so the system is commonly viewed as running a 'surplus.' Proper accounting requires that expenses be aligned in time with the receipt of value, so current outlays should be viewed as the system's cost, to be aligned against current tax receipts, only if the benefits delivered to the *current*

[10] The mandated purchase of Treasury bonds was a major source of conservative complaint against the funding program of the initial 1935 Social Security Act, for it seemed to give Franklin Roosevelt the ability to fund his New Deal programs without the need to increase taxes or float bonds on Wall Street.

contributors are the payments made to the *current* beneficiaries. This would be the case if Social Security were, for example, an instrument to pool an obligation of adult children to support their elderly parents; or if it were a device to induce the retirement of older workers who are inefficient or who block the employment and promotion opportunities of the young. But inasmuch as we view the benefit gained by current contributors as a promise of support in their own old age, proper accounting requires the inclusion of an actuarial estimate of the cost of the accruing benefit.

In the social insurance context, the level-tax figure could serve as a reasonable proxy of the program's annual expense. The argument runs as follows: Standard accrual accounting of pension costs identifies claims accrued in the current year as the "normal cost." Claims accrued in prior years are the program's "past-service cost." The "unfunded past-service cost" is the excess of the accumulated past-service cost above trust fund assets. The first full set of federal regulations for private pension funding, contained in the 1942 Revenue Act, required sponsors to recognize (and fund) an annual pension expense at least equal to the normal cost plus the interest on the unfunded past service obligation (to freeze the size of the unfunded liability). As a level payroll tax closely approximates this figure, it could be used as a reasonable measure of the annual increment in Social Security liabilities. Taking this perspective, one could view the Social Security system as currently running a deficit of approximately $145 billion, not a surplus of $70 billion.[11]

A critical question in determining the appropriate annual expense figure, in both private and public pension programs, is whether or not the past-service cost is part of the actuarial calculation of current pension expense. Nearly all private defined-benefit pension plans, like Social Security, granted credit for past service. Ignoring "future contributions," a private pension accounting entry analogous to future payroll tax receipts in the Social Security context, these plans all began insolvent, with large unfunded liabilities on their books. But the grant of past service credits was an essential element in the creation of almost all private (as well as public) plans. One explanation for assuming these burdens is that the current generation does indeed benefit from

[11] ERISA required private pension sponsors to amortize their unfunded past-service liabilities over a specified period of time depending on the type of plan and the vintage of the liability. Congress imposed this funding requirement, and established the Pension Benefit Guaranty Corporation, to increase the reliability of private pension promises. In a government-run program, the paydown of past-service liabilities is clearly less critical.

The level-tax figure and the 1942 minimum expense figure (normal cost plus interest on the past-service liability) are not identical. If the wage base is growing, the interest charge will tend to decline over time relative to the normal cost. However, expensing pension plan liabilities as a level percentage of payroll (a level-tax program) is a generally accepted actuarial practice.

payments made to current retirees—along the lines listed above. Another explanation, seen in chronically underfunded private plans and in public social insurance systems, is that acknowledging a past service obligation establishes a political and cultural claim for similar support when the current generation of actives grows old.

Recognizing a Social Security past-service obligation also acknowledges the fact that the current generation of actives benefit from investments made by their predecessors—investments made outside the pension system. Current workers benefit from private parental investments in child-rearing and from government-organized investments in education and infrastructure. A fundamental reason for the coming slowdown in wage-tax receipts, and the call for increased saving and investment within the pension system, is that these investments are not being made as they have been in the past.

Funding in a Privatized Social Security System

Proposals to restore Social Security to actuarial balance through increases in the payroll tax and a program of partial advance funding are motivated mainly by a desire to ensure the fiscal integrity of the system. The prime goal of proposals to move Social Security to a fully funded basis in the private pension sense, where all accrued obligations are matched by trust fund assets (the fruit of pension plan saving and investment), is generally to increase national saving, and ultimately future living standards.

Simulation studies suggest that the potential exists for increased economic efficiency from reforming Social Security in such a way that national saving increases. Kotlikoff, Smetters, and Walliser (1996) analyze the effects of privatizing Social Security using an extension of Auerbach and Kotlikoff's *Dynamic Fiscal Policy* simulation model (Auerbach and Kotlikoff 1987). They estimate that eliminating the current payroll tax and the accumulation of new benefit obligations, embarking on a savings program in which each generation pays for its own retirement, and levying a temporary flat rate consumption tax to pay for benefit obligations already accumulated, would result in national output being 6 percent higher after 25 years than it otherwise would be, and 11 percent higher after 150 years. Their estimate of the welfare of future generations is significantly increased under this scenario: The lifetime utility of people born 150 years after the reform is increased 5 to 9 percent (depending on the person's income class) as a result of the reform.

Underlying the projected increase in future output, however, is a decrease in the consumption of workers and retirees at the time of the transition. These generations must finance, in effect, two retirements.

They must pay the transition tax that extinguishes the system's unfunded past-service obligations, and they need to increase their private household saving to replace retirement benefits that they otherwise would accrue under Social Security. In alternative simulations where lump sum transfers and taxes are set such that the initial generations are not made worse off by the reform, Social Security privatization increases output by 3.5 percent after 25 years, and 6 percent after 150 years. Lifetime utility of members of future generations is increased by 1.7 percent. Thus, the increase in the welfare of future generations is much larger when those alive at the time of the transition are *not* protected than when they are. This illustrates the fact that most of the future gains from privatization, in the former unprotected case, come at the expense of those alive at the time of the transition.

The two simulations discussed above are based on the assumption that workers are not cognizant of any linkage between the payroll tax and future Social Security benefits (and so treat the payroll tax as a true tax rather than a contribution). In a recent simulation where Kotlikoff, Smetters, and Walliser (1997) instead assume that workers treat one-half of the tax as a desired contribution toward future benefits, and lump-sum transfers and taxes are used to protect the transitional generations, privatization results in a 0.5 percent *decrease* in the welfare of future generations. In this case, the consumption tax imposed to finance the transition results in a greater distortion than the payroll tax it replaces. If workers indeed treat one-half of the tax as linked to future benefit receipt, or if the benefit-tax linkage could be raised to this level, this simulation suggests that privatization could improve the welfare of future generations only by decreasing the welfare of current generations. But if one wants to improve the welfare of future generations and is willing to sacrifice the welfare of current generations, one need not privatize Social Security to achieve this result; other tools of fiscal policy (such as the imposition of a new consumption tax) could be equally effective in pursuing this objective.

Huang, Imrohoroglu, and Sargent (1996) also simulate the effect of fully pre-funding Social Security. Their model extends Auerbach and Kotlikoff's approach to modeling fiscal policy in an overlapping-generations, general-equilibrium setting by introducing life span uncertainty and random shocks to individuals' labor income; however, unlike the Auerbach-Kotlikoff model, their model treats labor income as exogenous. In a simulation of moving Social Security to a funded basis, they increase the tax rate on labor earnings for 40 years to build up an endowment of government-owned private capital sufficient to generate the income needed to pay Social Security benefits on an ongoing basis; after the 40-year transition period, the labor tax rate drops below its initial level, since Social Security benefits are no longer paid out of tax

revenue.[12] Aggregate consumption at first falls, as a result of the increased level of taxation, but eventually it rises above its original level. The efficiency gains associated with this reform are estimated at 2.8 percent of national income.[13]

It is instructive to compare these results with another Huang, Imrohoroglu, and Sargent simulation. There the government terminates the Social Security system and makes transfers such that those who were entitled to benefits are made no worse off as a result of the reform. Future generations of workers are assumed to save for their retirement on their own account. As before, the rate of the tax on earnings rises initially to pay for the transition benefits, and then falls well below its initial level. The efficiency gains associated with this reform are estimated at 2.0 percent of national income.[14] Huang, Imrohoroglu, and Sargent attribute the higher efficiency gain associated with their initial simulation—with a reform that retains the program's benefit structure—to the value of the insurance Social Security provides against the risk associated with earnings fluctuations and uncertain life spans. The efficiency gains from funding per se seem to stem from a suboptimal initial capital stock. As with the Kotlikoff, Smetters, and Walliser simulation results, the key factor appears to be increasing taxation in the short run to build up the capital stock. Funding Social Security is one way to do this, but other fiscal policies might work just as well.

The simulation studies suggest that fully funding Social Security would increase future output and living standards.[15] However, this would come at the cost of temporarily decreased consumption levels during the transition period. Reforms that do not adversely affect the transition generations are less likely to result in a large increase in the economic welfare of future generations.

One should also recognize that simulation studies cannot capture all details of how the transition to a reformed Social Security system would work. Because the value of the social insurance provisions in the current system are often not fully modeled, some simulations may overstate the potential gains from privatization or other radical reforms. In evaluating

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[12] This is a much larger degree of pre-funding than contemplated in the reform proposals commonly considered.

[13] The efficiency gain is 2.84 percent under the assumption of a closed economy with endogenous prices, but 2.12 percent under the assumption of a small open economy with exogenous factor prices. The efficiency gain is calculated as an annuity (reported in the paper as a fraction of GDP at the initial equilibrium) which is equal in present value to the change in wealth required to make the individuals in the simulations indifferent between the reform and remaining under the initial unfunded system.

[14] Again, this is for the endogenous factor prices case; when exogenous prices are instead assumed, the efficiency gain is 1.28 percent.

[15] Other simulation studies include Pecchinino and Pollard (1997) and Feldstein and Samwick (1997).

the merits of concrete reform proposals, it is important to consider whether the possible loss of desirable features in the current system outweigh the potential gains in future economic output due to reform.

Retirement Income Security

An important factor in evaluating proposals for Social Security reform is the degree to which the proposed reforms provide secure and predictable income to retirees. Many of the reform proposals would move at least part of Social Security from a *defined-benefit* (DB) to a *defined-contribution* (DC) structure. The current system is a DB pension plan that pays benefits determined by a formula based on past earnings, age at the time of retirement, and other factors. It provides an inflation-indexed annuity at the time of retirement, with the initial value of a worker's monthly benefits based on his or her highest 35 years of earnings (after all earnings prior to age 62 have been indexed to average wage growth). This provides a degree of retirement income security generally unavailable through private sector pension plans.

The Defined-Contribution Format

In a defined-contribution plan, workers and firms put specified sums into a pension account allocated to individual workers. That worker's retirement benefit is then determined by the balance in his or her account and the way that sum gets converted into an income stream.

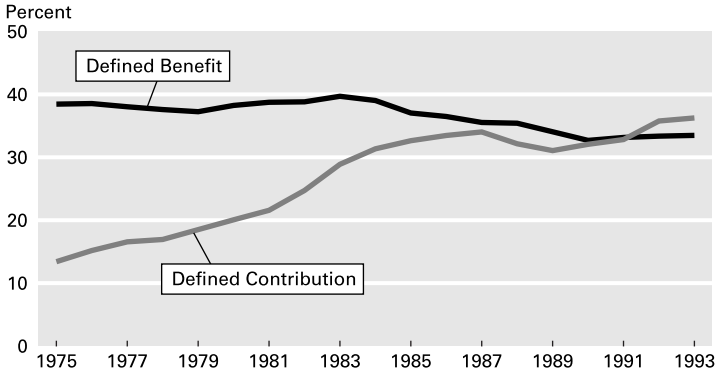
In the private sector, the percentage of workers enrolled in DC plans has grown rapidly, while the percentage of workers covered by DB plans has been declining (Figure 12). DB pension funds still held more assets than DC plans as of 1993, but total assets in DC plans were growing more quickly and by now likely exceed those in DB pension funds.[16]

One reason for the shift toward DC plans in the private sector may be that private DB plans face some of the same problems associated with an aging population as Social Security. Most sponsors can see their pension contributions rising in the future. The percentage of payroll that employers have paid into DB plans has been fairly low owing to the high rates of return on financial assets, which have reduced the need for contributions, and the funding restrictions imposed by the Omnibus Budget Reconciliation Act of 1987. Schieber and Shoven (1997) project that if employer contributions to DB accounts remain at their current level (as a percentage of payroll), then the nominal value of assets in DB plans will begin to decline in 2025, and DB plans would exhaust their trust-fund

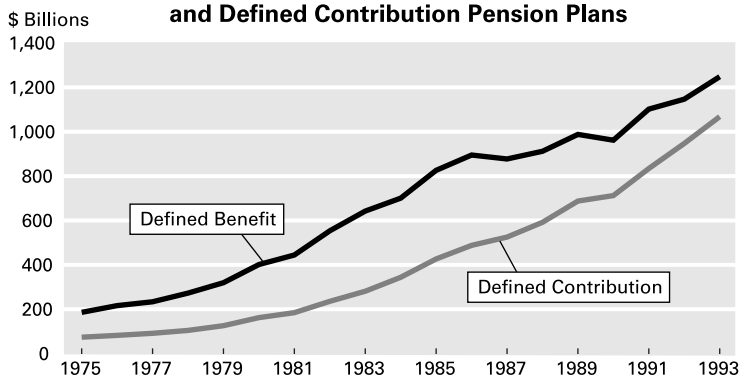
[16] Note, however, that DB plans are also backed by contingent claims against plan sponsors and the federal Pension Benefit Guaranty Corporation.

Figure 12
Characteristics of Private Pension Plans

Percentage of the Employed Civilian Labor Force That Participates in a Private Pension Plan, by Type of Plan



Market Value of Assets of Defined Benefit and Defined Contribution Pension Plans



Source: Form 5500 Series Reports filed with the Internal Revenue Service; compiled by the Pension and Welfare Benefits Administration of the U.S. Department of Labor.

assets by 2043. To avoid this, firms must contribute a higher percent of payroll to their DB plans or decrease the generosity of DB benefits accrued in the future. This is very similar to the dilemma faced by the Social Security system.

Schieber and Shoven also identify a financial problem specific to private DB plans. They speculate that a sell-off of retirement assets accumulated by the baby boom generation may depress asset prices during the baby boomers' retirement years. This raises the possibility that the financial crisis facing private DB plans may be even worse than

Schieber and Shoven's forecast suggests. DC plan sponsors would not face a similar funding problem, since they have no fixed obligations beyond their periodic contributions to their employees' accounts. It is the participants in DC plans who bear the risk associated with the effect of the boomers' retirement on asset prices.

An Early Defined-Contribution Proposal: The MUPS Plan

While private pension plans have been shifting toward a defined-contribution structure, proposals to do the same for Social Security have been floated before. An especially notable example comes from the waning days of the Carter Administration, early in 1981. The President's Commission on Pension Policy, appointed by Jimmy Carter, recommended that the federal government mandate a Minimum Universal Pension System (MUPS)—a compulsory DC program atop Social Security. Under MUPS, employers would contribute at least 3 percent of their wages and salary to a defined contribution pension account on behalf of each employee over 25 years old who had one year of service and 1,000 hours of employment with the current employer. The pension accounts could either be administered by the employer or placed in a "portability clearing house" to be managed by the Social Security Administration. Employees would be immediately vested, and their account balances would be portable between employers.

The Commission's primary motivation in advocating the MUPS seems to have been a perception that the elderly were economically vulnerable. Thus, the Commission also made proposals for strengthening the Supplemental Security Income program, for encouraging the employment of older workers, for reforming Social Security, and for providing new tax incentives for individual retirement saving.

The major changes in federal pension policy in the early 1980s, however, were the enactment of the 1983 Social Security Amendments and the 1981 Internal Revenue Service regulations that clarified the 401(k) tax rules. The IRS regulations greatly facilitated the growth of private DC plans. The Social Security Amendments, on the other hand, kept the public program firmly in the DB tradition; they raised the retirement age, accelerated scheduled increases in the payroll tax, and subjected the benefits of upper-income households to income taxation.

Relative Merits of Defined-Benefit and Defined-Contribution Plans

To evaluate a current shift in the Social Security system toward a defined-contribution structure, and to evaluate the place of such a program in the nation's larger retirement income system, it is useful to consider the relative merits of DB and DC plans in the private sector. From the employer's standpoint, DB plans serve two primary purposes:

to provide a tax-advantaged retirement savings vehicle to employees, and to provide an instrument for personnel management—for lengthening tenures, increasing work effort, and influencing retirement ages.[17] While DC plans also serve the first purpose, only DB plans serve the second. The decline of DB plans is in part a response to declining employer demand for these personnel services, as well as the projected increase in DB plan costs and risks discussed above.[18]

From the employee's standpoint, private DB plans have various attractive attributes. Benefit schedules do not depend on the rates of return available in financial markets, so employers implicitly insure employees against rate-of-return risk. DB plans base benefits on the last five or so years of salary, so they largely protect employees from inflation up to the time of retirement. DB benefits are annuities, paid out at a constant rate until the retiree dies, so employers insure against longevity risk.[19] This mandatory annuitization may be beneficial to employees, since markets for individual annuities suffer from high marketing costs and serious adverse selection problems.[20] While DC plans can offer annuitization as an optional or mandatory feature (TIAA/CREF is a notable example—currently as an option, formerly mandated), annuitization is currently not very common. With the decline of private DB plans, these various protections will be less available to U.S. workers outside the government Social Security program.

The protection Social Security offers workers is superior to that found in standard employer DB plans. Social Security benefits are immediately vested and completely portable, eliminating the vesting, inflation, and productivity risks in the value of benefits earned at former employers.[21] Employer DB plans base benefits largely on earnings at the end of a

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[17] DB plans discourage turnover by penalizing workers who leave early in their careers—leavers get a benefit based on their earnings at the time of termination, and inflation will erode its purchasing power between then and the time of retirement. DB plans encourage work effort by the heavy weight they place on final salary in their benefit formulas; this amplifies the cumulative effect of traditional rewards such as pay increases and promotions and further raises the cost of being fired. DB plans influence retirement behavior by specifying benefit formulas that shift annuity levels at different combinations of age and service; sponsors often maximize the present value of retirement benefits within an age-specific window, usually around age 60, and workers often leave in response.

[18] Defined-contribution plans also offer some personnel services. They provide a tax-advantaged means of saving for retirement, and so are an attractive fringe benefit to employees. They also influence retirement behavior through a wealth effect. But DC plans do little to discourage turnover, because of the portability of their account balances, and they give employers very little influence over retirement ages. DC plans, as a result, are not an especially powerful or flexible tool of personnel policy. See Sass (1997).

[19] A provision for continuing payments to a surviving spouse is often included, for ERISA mandates the joint-and-survivor annuity as the default annuity form.

[20] Poterba, Mitchell, and Warshawsky (1997) provide a recent analysis of annuity pricing.

[21] These risks are that the employee did not stay long enough to vest; that inflation eroded the value of a nominal vested benefit; or that (real) incomes rose over time so

worker's career with a firm and this, as Bodie, Marcus, and Merton (1988) point out, subjects employees to considerable risk associated with the growth of their earnings at the firm. Social Security bases benefits on 35 years of indexed earnings (the highest 35), so workers are not subjected to this risk. Finally, private DB benefits are rarely indexed to inflation, and cost-of-living adjustments are generally ad hoc and partial. Social Security provides inflation protection by indexing monthly retirement benefits to the CPI.[22]

The private-sector shift to DC plans, however, has not been unambiguously bad for workers. They no longer have the same degree of retirement income security. But DC arrangements provide greater latitude over contribution levels and investment choices, allowing workers to customize retirement saving to suit their tastes and financial circumstances. Contributions to individual DC accounts also appear much more like normal labor remuneration than the contributions made on workers' behalf to DB plans. Workers can see their DC account balances accumulating, and they know that they or their heirs will get to use these funds. So workers can easily see the link between their current work effort and their accruing claims against the retirement program.

The link between current work effort and increments in a DB plan, in contrast, is much harder to understand. The value of a current accrual in a private-sector DB plan is best characterized as a complex probability distribution based, in part, on a worker's current age, service, salary, health, and prospects with his or her current employer. Firms expense, each year, a particular sum as the cost of the pension plan. But this figure has many arbitrary elements and is never allocated to individual workers. So it is hardly surprising that workers have little understanding of how pension plan accruals figure as part of their compensation.

The Social Security benefit formula is arguably easier to understand than that of most private DB plans. But the link between current earnings and future benefits is probably still too complicated for most employees to understand and to internalize in their decisionmaking. This is unfortunate, since to the degree that employees are not cognizant of the link between earnings and future benefits, they will treat the payroll tax as a tax, and not as a payment toward purchase of a retirement annuity.

The degree to which employees *should* treat their payroll tax as a payment toward purchase of a retirement annuity varies over workers. Feldstein and Samwick (1992) calculate the implicit marginal tax rates faced by workers when the impact of their current payroll taxes on future

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retirement benefits earned at former employers replace a smaller portion of final salary, or of income levels common in the community at the time of retirement.

[22] Social Security also indexes accruing benefit credits to inflation by indexing the earnings that enter its benefit formula to average wage growth—a different mechanism than the final salary approach taken by most private DB plans.

Social Security benefits is taken into account. The implicit tax rates vary with the worker's gender, marital status, earnings history, and other characteristics. Some workers receive net marginal subsidies from the system, and should regard themselves as facing a negative tax rate, while for others the implicit tax rate is equal to the statutory rate.

Hybrid Plans

Several new hybrids of defined-benefit and defined-contribution plans have recently emerged in the private sector. According to an Employee Benefit Research Institute survey of firms adopting the hybrid plans (Campbell 1996), firms often cited employees' lack of understanding and appreciation of a former DB plan as a factor in the decision to adopt a hybrid plan. Employers were paying for a benefit that employees did not fully understand, a problem similar to the lack of understanding of the link between current earnings (and payroll taxes) and future benefits in Social Security. In both cases, employees are not fully cognizant of how the accrual of pension benefits contributes to their current labor remuneration.

Another factor cited by firms adopting hybrid plans is the need to restructure their pension plan in such a way as to provide greater portability and accrual of benefits at younger ages. A perceived decrease in job security has increased employees' valuation of portability and decreased the value younger workers place on pension plans in which benefits do not accrue until late in their careers. Because it is fully portable between jobs, Social Security is not subject to these concerns.

In cash-balance plans, which appear to be the most prevalent of the hybrids, each employee in the DB plan has a hypothetical account. Account balances grow over time as a result of benefit credits and interest credits. The benefit credits are typically some percentage of the employee's salary, although they are sometimes age or service related. The interest credits are made either at a pre-specified rate or at a rate linked to a specified index (the rate of return realized on the plan's assets need not be linked to the interest rate used in calculating the interest credits). Upon retirement, the employee receives an annuity with an expected present value equal to the account balance. At the employer's option, the plan can also allow lump-sum distributions.[23]

One variant of cash-balance plans is the minimum balance pension plan (Campbell 1996), in which employees receive as a pension benefit

[23] Although cash balance plans appear to resemble defined contribution plans, they are classified as defined-benefit accounts by the Internal Revenue Service. The cash balance "accounts" are just accounting devices, not actual accounts. Employers are subject to all DB-plan regulations and also decide on how the plan's assets are invested.

the greater of the annuity due under a cash balance plan and that due under a traditional defined-benefit formula. By providing a hypothetical account balance that workers can see increasing, minimum balance pension plans, like all cash-balance plans, increase the degree to which workers consider the cost of the plan to be part of their current remuneration. This would be especially true of young workers, who realize significantly greater benefit accruals than they would in traditional final salary DB plans. Because of the DB plan component, however, minimum balance plans limit workers' exposure to rate-of-return risk; they also allow employers to use the pension plan to provide age-specific retirement incentives.

Hybrids and Social Security Reform

Minimum balance pension plans provide a potential model for Social Security. Such a format could increase the degree of benefit-tax linkage, and thus reduce the deadweight loss associated with the payroll tax without reducing the degree of retirement income security provided by its defined-benefit structure. Hypothetical Social Security accounts could be set up for each worker which would grow over time such that the account balance would be sufficient to purchase an indexed annuity, upon the worker's retirement, that would generate the same monthly income the worker is entitled to under Social Security. These accounts would never actually be liquidated, except when converted to the Social Security annuity benefit; they would merely serve as an accounting device useful for communicating to workers how their current work effort is contributing to their Social Security wealth. Several features of Social Security's benefit formula would create difficulties in determining how the balances in the individual accounts would accumulate: the dependence of Social Security monthly benefits on marital status and the spouse's earnings record, the nonlinear relationship between Average Indexed Monthly Earnings (AIME) and the Primary Insurance Amount, and the use of only the highest 35 years of indexed earnings in computing AIME. However, the magnitude of this problem would be reduced by some of the reforms recommended by members of all three 1994-1996 Advisory Council factions, such as the extension of the number of years of earnings used in computing AIME from 35 to 38.

Boskin, Kotlikoff, and Shoven (1988) proposed a reform of Social Security that would have some features of the hybrid DB-DC plans. In their plan, each year workers would accumulate credits which would be used to "purchase" indexed old-age retirement annuities (payable starting at age 62), disability annuities, old-age spousal survivor annuities, and child survivor annuities. Credits would be related to payroll tax contributions through a progressive schedule, with members of poor families receiving credits larger than their tax payments and members of

high-income families receiving credits smaller than their contributions. The system would not be fully pre-funded because of the need to use current tax revenue to finance previously accrued benefit obligations of the system. The rate of return used in the annuity calculations would be chosen such that the system remained in actuarial balance. An unexpected increase in longevity or a drop in payroll tax receipts below expectations would necessitate that a lower rate of return be used in calculating future annuity accumulations but would not affect annuities already "purchased." Thus, participants would be less vulnerable to changes in rates of return and asset prices than they would be in standard defined contribution plans. The Boskin-Kotlikoff-Shoven proposal is an interesting example of how individual accounts could be introduced into Social Security while retaining its redistributional characteristics and without increasing pre-funding or introducing the degree of financial risk usually associated with DC plans.

Differences Between DB and DC Variants of Social Security

Fewer differences exist between the current DB Social Security program and proposed quasi-privatized DC alternatives than between private DB and DC plans. Even if Social Security were converted into a quasi-privatized defined contribution structure, with funded individual accounts, it would no doubt retain social insurance elements that would distinguish it from private DC plans. The degree to which these social insurance features would be retained following reform is, of course, a policy decision, and some of the reform proposals would shift Social Security far from its current social role.

Redistribution from high to low earners is often thought to be an essential element of Social Security that would be lost under a defined contribution system. However, the Personal Security System proposal of Kotlikoff and Sachs (1997) includes a provision for a supplemental contribution by the federal government to the accounts of workers with low earnings. Other proposals would include a redistributive flat dollar benefit in addition to the DC account (as in the Personal Security Accounts proposal of one of the Advisory Council factions) or would increase the progressivity of the defined benefit portion of Social Security by introducing a supplementary mandatory defined-contribution plan (as in the Individual Accounts proposal of Advisory Council members Gramlich and Twinney). Although the degree of progressivity provided varies from one proposal to another, in principle there is no reason why a defined-contribution variant of Social Security could not provide a degree of redistribution similar to that under the current system. However, the current DB structure has the advantage of being able to offer redistribution on the basis of average lifetime earnings, while a DC

program would most likely base its redistributive contribution formula on current earnings.

Annuitization is another component of DB plans that could be threatened in a DC system. Some DC proposals, however, require that the assets in the individual accounts be used to purchase indexed annuities at the time of retirement (examples are the Individual Accounts proposal of Advisory Council members Gramlich and Twinney, and the Personal Security System proposal of Kotlikoff and Sachs). The current defined-benefit structure of Social Security may also appear to provide superior insurance against increases in the cost of annuities due to increases in life expectancy. But here again, the differences between DB and DC variants of Social Security may be smaller than first appears to be the case. Under current law, the normal retirement age used in computing benefits will gradually increase from 65 to 67. A majority of the Advisory Council members were in favor of accelerating this increase and thereafter indexing the normal retirement age to increases in life expectancy. With indexation of the normal retirement age, an increase in longevity would reduce the Social Security benefits available to a worker retiring at a given age by an amount similar to the increase in the price of an annuity providing a given level of retirement income.

Another difference between defined-benefit and defined-contribution variants of Social Security is that while the current defined-benefit structure could be left largely unfunded or moved to a funded basis by increasing tax rates, defined-contribution accounts, because they are owned by individual workers, must be funded. This difference, as well, may be more apparent than real. Under some reform proposals, the large unfunded liability of the current defined-benefit system at the time of privatization would be met by an increase in government debt. While privatization would prevent the growth of future unfunded liabilities, it would not necessarily fund liabilities already accrued.

Some have argued that retirees would be subject to less political risk under a defined contribution system. Carter and Shipman (1996) cite public opinion polls that suggest widespread skepticism regarding whether Social Security will be able to survive the retirement of the baby boom generation. Since defined-contribution accounts would be individually owned, they seem less subject to political manipulation than a politically determined defined-benefit structure. The Advisory Council acknowledged this problem in advocating that Social Security should continue to be funded out of dedicated revenue sources, rather than out of general federal tax revenue. However, defined-contribution accounts (whether part of a private plan or a mandatory public scheme) may be subject to greater future political risk than their proponents realize. Large flows of asset income to the accounts, and huge distributions from the accounts during the baby boomers' retirement, may provide a very tempting target for future federal tax policymakers. The introduction of a

VAT or other broad-based consumption tax, for example, would be one way to effectively tax the account accumulations.

One area where there *is* an essential difference between defined-benefit and defined-contribution variants of Social Security is in how vulnerable workers are to changes in asset prices and rates of return. Workers are insulated from this risk under a defined-benefit system, but not under a defined-contribution system. Of course, under a funded defined-benefit system, workers do indirectly bear the risk of financial market fluctuations if the trust fund's assets are invested in risky assets.[24] However, the government has the ability to spread the effect of large unexpected swings in asset prices over several generations under a defined-benefit system.[25] Protection from financial market fluctuations is a valuable benefit of Social Security's defined-benefit structure. As a result of the relative decline of private DB pension plans, workers are increasingly exposed to this source of risk.

Exposing workers covered by Social Security to changes in asset prices and rates of return could significantly affect private retirement programs—the component of the U.S. retirement income system where risk and equity investments are currently concentrated. If workers face increased risks in their baseline Social Security benefit, they and their employers might seek more security in their private arrangements. Workers could shift 401(k) and other retirement savings portfolios toward safer investments, which would partially unwind the government-induced shift toward higher expected returns in the nation's retirement income system.[26] Workers might also find employer DB plans increasingly attractive.

How employers might respond to a DC privatization is harder to foresee. Without a well-defined Social Security benefit, employers might not be able to use their DB plans to influence retirement behavior with any great precision; they could not simply "top-up" a worker's Social Security pension to offer age-specific replacement rates as age-specific retirement incentives. If Social Security's DB component declines, however, workers have fewer age-specific retirement incentives, and their

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[24] Bohn (1997, this volume) and Smetters (1997) discuss how investment of the trust fund in risky assets affects the distribution of risk-bearing.

[25] In principle, the government could use taxes and transfers outside of Social Security to provide the same intergenerational risk pooling which is available under Social Security. However, this is likely to be very difficult to achieve in practice.

[26] The establishment of a riskless Social Security system helped speed the decline of insurance company guarantees in the private pension institution and accelerate its shift into trusteed plans with equity investments. The Pension Benefit Guaranty Corporation, which has the federal government insuring trusteed private plans, should dampen employee demands for safer DB plan investments and private DB plan insurance in response to increased risk in the Social Security program (Sass 1997).

employers could find the ability of a private DB plan to influence retirement behavior increasingly valuable.

A final key difference remains between the current defined-benefit Social Security program and a privatized defined-contribution arrangement. Social Security is currently supported, in part, by taxes on future labor income. As such, it holds an "asset" the equivalent of which cannot be purchased in private financial markets. As Merton (1983) shows, Social Security can reduce inefficiencies associated with the nontradability of human capital, and it has the potential to improve the allocation of risk-bearing in the economy. This aspect of Social Security would be lost under a defined-contribution system.

CONCLUSION

In response to the coming increase in old-age dependency and resulting fiscal strain on transfer programs to the aged, fundamental changes to Social Security are now being considered. This paper has focused on two elements common to many reform proposals: increased funding of Social Security, and shifting the program from a defined-benefit to a defined-contribution structure.

Increased funding has two non-exclusive goals: to protect the fiscal integrity of the system and to increase national saving and future living standards. Restoring Social Security to actuarial balance through some combination of immediate tax increases and future benefit cuts would ensure the system's fiscal integrity and possibly also increase national saving. Fully funding Social Security, whether through privatization or through a massive increase in the trust fund under the program's current structure, would potentially result in a large increase in national savings. However, this is more a matter of general fiscal policy than of Social Security reform per se.

Moving Social Security to a defined-contribution structure would likely result in enhanced labor market efficiency, since such a shift would make transparent the link between contributions and eventual benefits. However, the current defined-benefit structure could also be reformed to increase the perceived degree of benefit-tax linkage. Many of the other differences between defined-benefit and defined-contribution variants of Social Security depend more on the details of the proposals than on inherent differences between defined-benefit and defined-contribution plans. These details, such as the degree of redistribution offered, are extremely important in determining whether a defined-contribution variant of Social Security would be able to fulfill the system's social insurance goals.

The dramatic demographic shifts now under way will necessitate changes in the way we support ourselves in old age. The longer we wait to reform our social insurance programs, the smaller the degree of

leverage we will have in dealing with the demographic changes. But before adopting major changes to Social Security, we need to be careful that the reforms will actually solve the problems they are intended to address, and preserve the ability of the system to meet its social insurance goals.

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Discussion

Diane J. Macunovich*

Certainly there is no shortage of reading material on Social Security these days. But there *has* been a dearth of material for those searching for a balanced discussion of the issues, more detailed (and accurate) than the typical journalistic piece but less focused on—and biased regarding—particular reform proposals.

This paper by Steven Sass and Robert Triest fills that gap very nicely. It sets out, for the uninitiated, all of the necessary "basics":

- the current goals of the Social Security system, emphasizing the desire to provide a secure and broad-based source of old-age income and pointing out that a new goal appears to have developed in recent years—that of increasing national saving.
- the system's achievements to date, most notably its contribution to the dramatic decline in poverty among the over-65s, even during periods like the early 1980s when poverty rates in other age groups were rising.
- the coming demographic crisis, as low fertility and increasing life expectancy lead us inexorably toward a worker–beneficiary ratio of 2.0—or even as low as 1.3.
- the financial implications of this demographic crisis, with 30 percent—or even 50 percent—of payroll needed to support Social Security and Medicare.
- a discussion of the different concepts of "funding" when people speak of a "fully funded" system, emphasizing that the Social

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Security system has been truly "pay-as-you-go" only in the brief period from 1972 to 1983.

- a discussion of the arguments in favor of some form of privatization, with increased national saving and higher returns at the top of the list.
- an explanation of the "deadweight loss" associated with the OASDI payroll tax when workers perceive it as simply a tax, rather than a contribution toward their own retirement security.
- a discussion and comparison of advantages and drawbacks in "defined benefit" and "defined contribution" pension plans, identifying Social Security as a defined benefit plan and pointing out that in the private sector such plans are rapidly succumbing to defined contribution plans.

With that base firmly established, the authors develop and discuss their own position: that many of the perceived differences between defined benefit plans (DBs) and defined contribution plans (DCs) are more apparent than real, with "the devil in the details" of specific reform proposals, so that the gains from a move toward privatization (and DCs) are variable and uncertain, while a significant cost is unavoidable—the increased exposure of individuals to asset risk and rate-of-return risk. This is a position I find hard to fault, so I will simply highlight a few aspects of their argument and then attempt to buttress it regarding uncertainty and risk exposure.

Sass and Triest refer often to the issue of national saving—understandably, given the increasing emphasis that seems to be placed on this newly identified goal for Social Security. They mention the economic argument that moving to a fully funded system should increase saving, thereby increasing economic output. But they stress that, to the extent that the trust fund represents a move in the direction of full funding, it appears not to have increased national saving to date, but rather to have made it easier for the government to expand its operating deficit. On the other hand, "If workers face increased risks in their baseline Social Security benefit, they and their employers might seek more security in their private arrangements. Workers could shift 401(k) and other retirement savings portfolios toward safer investments, which would partially unwind the government-induced shift toward higher expected returns in the nation's retirement income system (p. 60)." Most important, it seems to me, is their argument that the goal of increasing national saving would be much better served with policy changes in areas other than Social Security.

I am drawn inexorably back, however, to that issue of exposure to risk: the fact that many of the reform proposals achieve their goal of "fixing" Social Security simply by taking on more risk—while shifting that risk from the system, which can spread risk over individuals and generations, to individuals, and in effect changing "Social Security" to

"Social Insecurity." Given the uncertainty regarding benefits to be derived from any privatization of Social Security—so well described by Sass and Triest—and the certainty that with privatization some individuals will experience a considerable welfare loss in the form of increased exposure to risk, I think it is important that we be sure we are really facing a crisis before taking such an important step.

In that regard, I find it impossible to discuss these issues without making reference to some highly unorthodox findings that have greatly influenced my own thinking in this area in recent months. I think you will find them intriguing, and they may lead you to reconsider the future prospects of Social Security and to focus more on the issue of market risk.

The perceived need to "fix" Social Security arises largely from two factors: the aging baby boom generation's dependence on the baby bust for support in retirement, and our fairly pessimistic prognostications regarding the future performance of the economy. The first is inevitable (although an intermediate rise in the birth rate could ameliorate even that dilemma), but the second much less so. Our forecasts of *slow growth over the next 75 years* (and I emphasize this because it represents such a sweeping generalization over a very long time span) derive from the seemingly enshrined belief that we entered a "new era" in 1973 and can no longer anticipate periods of growth like that of the fifties. But an increase in the assumed rate of growth of real wages over the next 75 years would effectively eliminate the funding crisis.

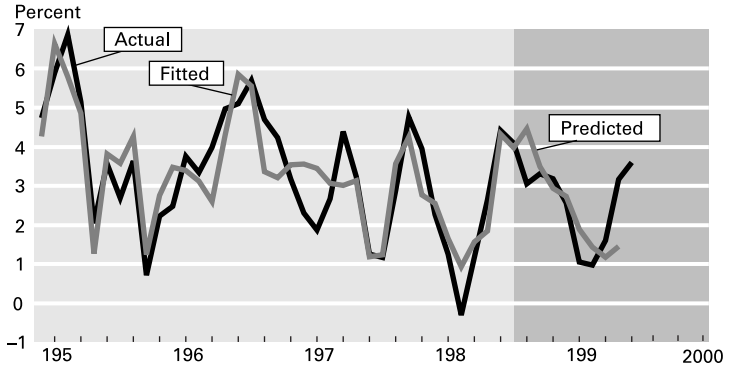
So the question about what happened in—and since—1973 is crucial in any considerations here. My findings—only preliminary, and highly unorthodox as I mentioned earlier—suggest that our "new era" has been largely a function of the changing age structure of our population. And because of the highly nonlinear pattern of past and future population changes, we err greatly in relying on linear economic forecasts for projecting Social Security over a 75-year period.

With that in mind, let me take you very quickly through an exercise in which I test for a relationship between age structure and various economic indicators over the last century. I present in Figures 1 to 3 the results of a few simple regressions, comparing actual and fitted values, using as independent variables in each case a set of (logged) population variables.[1]

Figure 1 presents results for a three-year moving average of the annual percentage change in GDP; Figure 2 presents results for the personal saving rate, the ratio of personal saving to disposable income; and Figure 3 presents results for the annual change in the CPI. In each

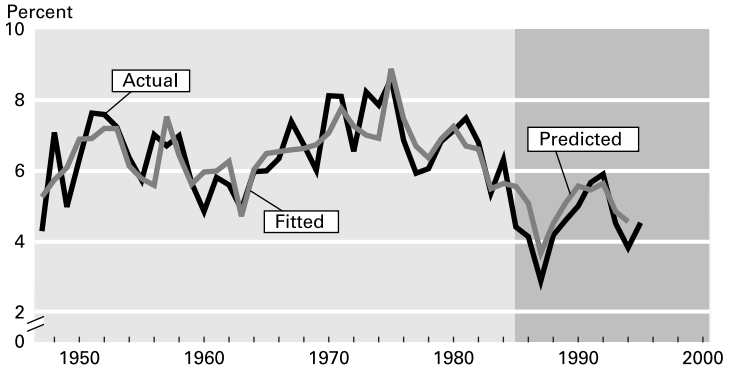
[1] These variables are described in the Appendix, where the regression results are presented in Tables A-1 and A-2.

Figure 1
Actual and Fitted Annual Growth Rates of Real GDP, 1949 to 1994[a]



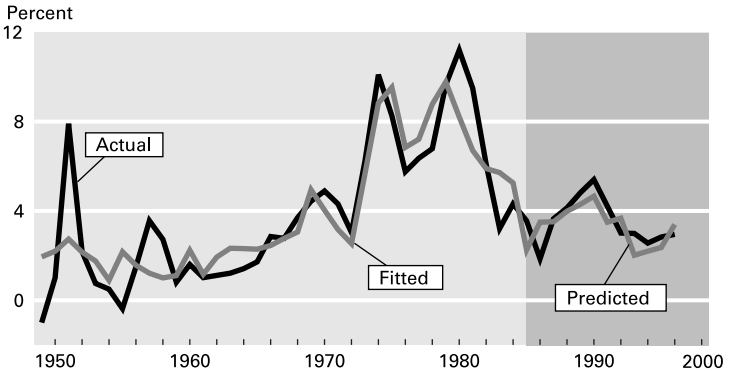
[a] Three-year moving average. Values after 1985 predicted using 1949-85 data for a set of (logged) population variables. See the Appendix.

Figure 2
Actual and Fitted Annual Personal Saving Rate, 1947 to 1994[a]



[a] See Figure 1. Personal saving rate = ratio of personal saving to disposable income.

Figure 3
Actual and Fitted Annual Change in the CPI, 1949 to 1994[a]



[a] See Figure 1.

case, a model based on data through 1985 has been used to predict values for the years 1986 to 1994.

It can be seen that the population variables do a fairly respectable job of fitting the long-run values in each of these series. Why would this be the case? To explore possible connections, we need to consider the pattern of age changes during this century. Figure 4 provides an indication of the years when various age groups in the United States experienced a decline; we can see the "waves" of decline created by the aging of the baby busts of the Depression, the post-1959 fertility decline, and even the 1945 and 1949 fertility troughs associated with World War II.

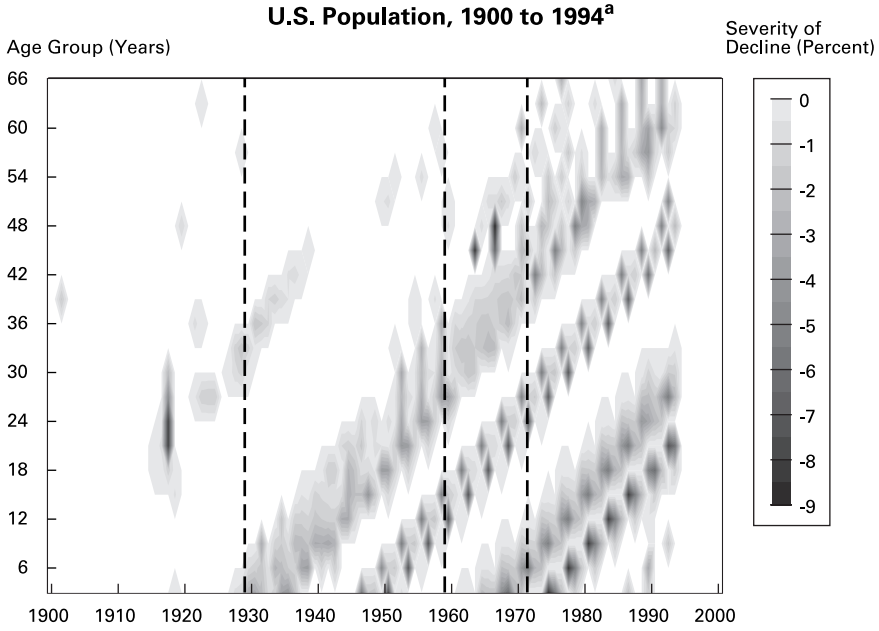
We can see that apart from a "blip" in 1918 the U.S. economy enjoyed virtually uninterrupted growth in all age groups until about 1928 or 1929, and that beginning in the late 1950s several age groups entered into prolonged decline. By far the worst period for such declines (in terms of both the number of age groups in decline and the severity of declines in each group) occurred in the period following 1972.

It appears to me to be more than coincidence that these periods of age-group decline coincide with notably weak periods for the economy. A changing age structure can affect overall consumer demand in two ways. The first is a straightforward *compositional* effect: Population decline implies a decline in consumer demand, with the severity of the decline dependent on a cohort's stage in the Modigliani life cycle. The second is perhaps more controversial, in that it involves *changes in age-specific behavior* brought about by "relative income" effects of the changing age structure. That is, as postulated by Richard Easterlin (1980), changes in the relative supplies of workers (grouped by age/experience) will tend to reduce the earning potential of larger cohorts relative to that of smaller cohorts, because of imperfect substitutability among workers with different levels of work experience. When the earning potential of young people declines relative to that of their parents, young people will tend to alter their behavior in ways designed to improve their per capita disposable income: for example, by delaying marriage and childbearing and increasing female participation in the labor force. These demographic adjustments will in turn affect age-specific patterns of consumption. An economy as finely tuned to market demand fluctuations as ours could easily be tripped into a downward spiral by such a combination of compositional and age-specific demand fluctuations, as producers cut back in response to reduced consumer demand.

Work reported elsewhere has documented instances of changing demographic behavior resulting from changing age structure.[2] Here, I have made use of two data sources to approximate the magnitude of the more straightforward compositional (age-driven) demand fluctuations:

[2] See, for example, the articles by this author listed in the references.

Figure 4
Periods of Decline among Selected Age Groups in the U.S. Population, 1900 to 1994[a]



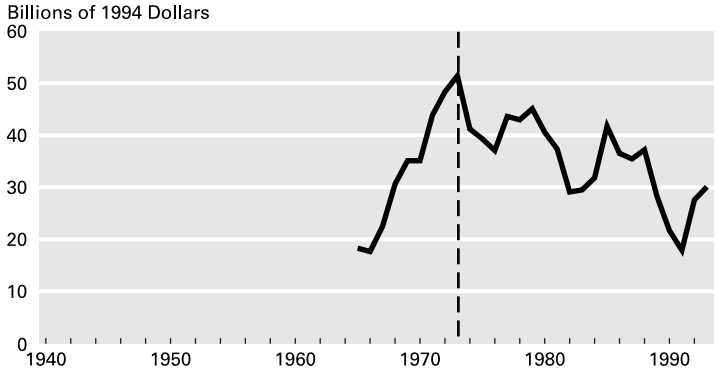
[a] Darkness of shading indicates severity of decline, from less than 1% to nearly 9%.

- estimates prepared by Edward Lazear and Robert Michael (1988) regarding the variations in parental expenditures induced as children age, holding income constant.
- 1972 and 1992 Consumer Expenditure Survey (CES) data on the variation in household expenditures by size of the household and age of its head.

By combining these data with actual age distributions in the population each year, it has been possible to estimate the changes in consumer demand that would have occurred *solely as a result of compositional demographic changes* over the past 35 years, that is, holding income and expenditure patterns constant at their 1972 levels. The results are presented in Figure 5 for households generally (data on households by size were available only back to 1963), and in Figure 6 for the additional "kick" provided by the aging of young children in these households.[3]

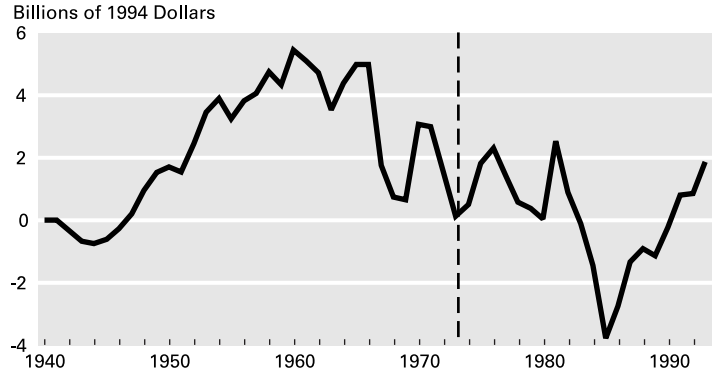
In both figures we see the strong growth in expenditures triggered by demographic changes in the 1950s and 1960s, and even more notable is the sharp change that occurred in 1973. In Figure 5 we can see a clear

Figure 5
Demographically Induced Annual Change in Domestic Consumption, 1965 to 1993[a]



[a] Using 1972 and 1992 Consumer Expenditures Survey expenditure patterns, by size of household, and estimates from Lazear and Michael (1988).

Figure 6
Extra Demographically Induced Annual Change in Domestic Consumption Resulting from Changing Age Composition of Children, 1943 to 1993[a]

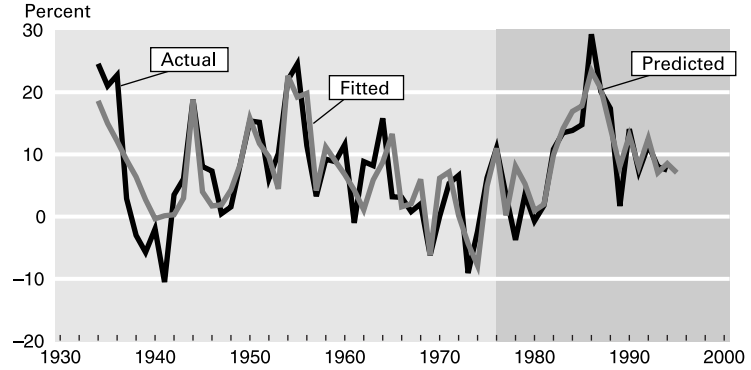


[a] See Figure 5.

correspondence between these demographically induced changes in consumer demand and the three strong recessions we have experienced in the past 25 years. (These graphs, while providing an indication of relative fluctuations, must be interpreted as only the lower bound of age

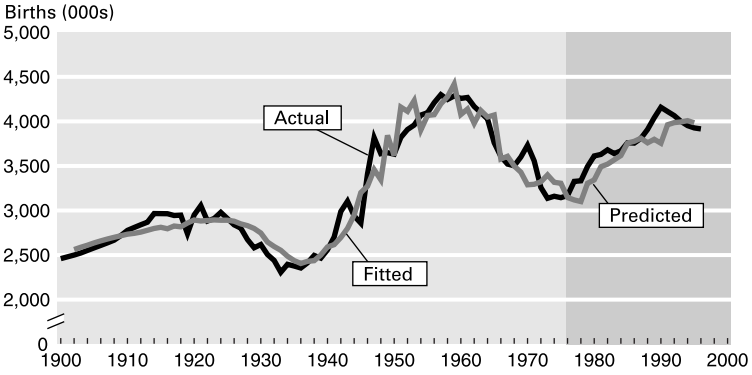
[3] Note that this is not double-counting, since CES expenditure figures are averages over all households by size. And as Lazear and Michael point out, the between-group expenditure variations among households by size are remarkably small and dominated by the within-group variations by age of children.

Figure 7
Actual and Fitted Values for Annual Percent Change in the Dow Jones Industrial Average (Three-Year Moving Average), 1935 to 1994[a]



[a] Values after 1976 predicted using 1934-76 age structure variables. See the Appendix.

Figure 8
Actual and Fitted Values for the Number of Births in the United States, 1900 to 1994[a]



[a] Values after 1976 predicted using 1900-76 age structure variables. See the Appendix.

structure effects, since no "multiplier effects" on business or government spending are included.)

Moreover, the changes in consumer demand pictured here are *not* the result of worsening economic conditions, since they hold both household incomes and expenditure patterns and levels at constant 1972 values: Any demographic response to worsening economic conditions would simply have made these declines even more dramatic. The only thing changing in these graphs is the demographic composition.

Figures 7 and 8 demonstrate that the age structure effects depicted in

Figures 1 to 3 appear to have even wider implications. Figure 7 suggests a close correspondence between financial markets and these demographic effects: A model fitted on age structure variables for the 1934–76 period does an excellent job of predicting the actual pattern of the Dow Jones Industrial Average (a three-year moving average of annual percentage changes in the DJIA) from 1977 to 1994. And Figure 8 suggests a similar close correspondence between age structure and the annual level of births in the United States: Presumably these age structure variables affect economic performance, which in turn affects demographic behavior such as household formation and the fertility rate.

So, after this long digression, how does all this relate to the Sass–Triest paper? These results suggest that we as a population have effectively shaped our own economic destiny—that we should take more account of past effects of the changing age structure in contemplating effects in the future. We need to consider seriously the possibility that the economic slowdown since 1973 has been caused largely by changing demographics, and incorporate this relationship when we try to extrapolate from the last 25 years. A "new era" of continuing slow growth over the next century is not inevitable. In fact, in the preliminary regression results underlying the graphs presented here, increases in the past in retirement-age groups appear to have benefited growth, rather than detracted from it. We need a great deal more work in understanding these effects before we make dramatic changes based on current pessimistic forecasts.

The progressing "waves" of decline among age groups pictured in Figure 4 suggest that our biggest problem in the next few decades will arise from the baby bust, as it causes declines among the ages of peak household expenditure. If the economy continues to overreact to demographically induced declines, we could face another serious recession in about 10 years' time—this would produce yet another baby bust, which would in time generate its own recession. But surely this is a vicious cycle that could—with knowledge—be made virtuous.

The results presented here have implications not just for longer-term economic forecasts, but for the short term: implications that are directly relevant to the issue of exposure to asset risk and rate-of-return risk. To the extent that financial markets actually respond to age-structure-induced changes, as is suggested by Figure 7, the already-generated waves of decline shown in Figure 4 promise considerable volatility in markets over the next few decades. Do we really want Social Security reforms that would expose retirees to that degree of market volatility?

Appendix

Five different models have been estimated here, using population variables as regressors, in some cases together with dummy variables for wartime and the oil price shock. The population data were used in 3- and 6-year age intervals, in order to be consistent with analyses of consumption patterns by age of children presented in Lazear and Michael (1988), where data were presented for the age groups 0 to 5, 6 to 11, 12 to 17 and 18 to 23. The following notes describe the variables presented in Table A-1 below.

a) The war dummy was set equal to 1 for the years 1950–52 (Korea) and 1964–65 (Vietnam).

b) The oil shock dummy was set equal to 1 for the years 1974–75.

c) The age structure variables represent the (logged) annual change in each age group, where, for example, the logged change in the 6–11 age group in a given year was calculated as *log(population aged 6) − log(population aged 12)*; that is, the number just entering an age group minus the number who have just left it.

d) The "prime age females" variable used in the total births regression was calculated as (the log of) the number aged 20–24 relative to the number aged 40–44.

e) The "relative cohort size" variable is one which I have used in numerous other studies to represent the aggregate demand effects of changing relative cohort size. It is defined as $log(RCS_{t+2}) - log(RCS_{t-2})$, where "*RCS*" is defined as the size of the population aged 20–24 relative to the size of the population aged 45–49, and is thus positive on the "leading edge" of the baby boom and negative on its "trailing edge."

The regression results for Figure 7 (the three-year moving average of the annual change in the Dow Jones Industrial Average) are presented in Table A-2 below.

Data Sources

Annual population (including armed forces overseas), by single year of age: *Current Population Reports—*

1990–94: PPL-21 Appendix B
1988–89: P-25 #1057
1986–87: P-24 #1022
1980–85: P-25 #1000
1970–79: P-24 #917
1960–69: P-25 #519
1900–1959: P -25 #311

GNP/GDP, personal disposable income and savings, CPI: *Statistical Abstract of the United States*, various years, and *Historical Statistics of the United States, Colonial Period to 1970.*

Total Births and General Fertility Rate (GFR):

Vital Statistics: Natality,

"Annual Summary of Births, Marriages, Divorces and Deaths: United States, 1994", *NCHS Monthly Vital Statistics Report, 43(13): 10/23/95,*

"Births and Deaths: United States, July 1995–June 1996", *NCHS Monthly Vital Statistics Report, 45(10, Supplement 2): 4/30/97*

Table A-1
Regression Results for Figures 1–3 & 8
(t-statistics in parentheses)

	Figure 1: Real GDP 3-year moving average of ($GDP/GDP_{t-1} - 1$)		Figure 2: Savings Rate personal savings/ disposable income		Figure 3: CPI $CPI_t/CPI_{t-1} - 1$		Figure 8: Annual Total Births in thousands, logged	
Period	1949–94	1949–85	1947–95	1947–85	1949–96	1949–85	1900–94	1900–76
War dummy[a]	.019 (4.4)	.019 (4.1)	.006 (1.5)	.006 (1.5)				
Oil shock[b]	−.014 (1.9)	−.016 (2.1)			.034 (2.5)	.036 (2.2)		
Age 1–2[c]							−.119 (2.6)	−.103 (1.7)
Age 3–5[c]	.057 (3.7)	.058 (3.6)					−.144 (2.4)	−.127 (1.7)
Age 6–11[c]	−.054 (4.3)	−.059 (4.0)	.085 (6.1)	.077 (4.2)	.072 (2.2)	.071 (1.7)	.627 (9.7)	.590 (7.5)
Age 12–17[c]							(4.1) .271	(4.4) .355
Age 24–29[c]			.083 (6.0)	.081 (5.1)	.068 (2.1)	.065 (1.6)		
Age 27–32[c]	−.049 (3.0)	−.048 (2.6)						
Age 30–35[c]			.058 (4.5)	.050 (2.8)	.119 (4.3)	.109 (3.1)		
Age 48–53[c]			.052 (2.6)	.044 (1.7)	−.059 (1.4)	−.076 (1.3)		
Age 60–65[c]	.085 (3.0)	.108 (2.9)			−.182 (4.2)	−.172 (2.1)		
Prime age females[d]							.119 (2.6)	.103 (1.7)
Relative cohort size[e]	.019 (1.7)	.021 (1.2)	.048 (4.2)	.037 (1.3)	.065 (2.8)	.067 (1.6)	.144 (2.4)	.127 (1.1)
Total population (000s logged)			.009 (1.0)	.011 (0.6)			.496 (25.2)	.472 (12.9)
Intercept	.021 (4.1)	.017 (2.4)	−.060 (.6)	−.089 (.4)	.055 (6.5)	.056 (6.5)	2.301 (10.4)	2.562 (6.3)
No. of observations	45	37	48	39	48	37	94	75
F-statistic	14.70 (7,37)	12.89 (7,29)	16.35 (7,40)	5.61 (7,31)	15.42 (7,40)	11.44 (7,29)	181.30 (7,86)	123.09 (7,67)
Adj. R-square	.685	.698	.696	.459	.682	.670	.931	.920

Note: See the text of the Appendix for notes describing the variables.

Table A-2
Regression Results for Figure 7
(t-statistics in parentheses)

Period	1934–94	1934–76
WWII (=1 for 1944)	.152 (2.7)	.152 (2.3)
Vietnam (=1 for 1969)	−.131 (2.4)	−.133 (2.1)
Oil Shock (=1 for 1976)	.112 (2.0)	.097 (1.4)
(logged) population aged 6	.480 (3.7)	.531 (2.3)
(logged) population aged 9	−.470 (3.7)	−.469 (2.0)
(logged) population aged 18	−.370 (4.6)	−.323 (2.0)
(logged) population aged 27	.516 (5.3)	.530 (3.7)
(logged) population aged 45	−.364 (3.5)	−.346 (.8)
(logged) population aged 66	−1.350 (5.5)	−1.249 (1.9)
(logged) total population	2.126 (4.0)	1.881 (1.4)
Intercept	−13.888 (4.9)	−12.744 (1.5)
No. of observations	61	43
F-statistic	10.85 (10,50)	5.65 (10,32)
Adj. R-square	.621	.526

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