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FUNDING PENSIONS: ISSUES AND IMPLICATIONS FOR FINANCIAL MARKETS

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FUNDING PENSIONS: ISSUES AND IMPLICATIONS FOR FINANCIAL MARKETS

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Introductory Remarks

Frank E. Morris*

This is the 16th of a series of conferences sponsored by the Federal Reserve Bank of Boston. In planning these conferences, our first objective has been to select a topic which we expect to be a prominent issue of public controversy in the years immediately ahead. The second is to bring together a small group of people with considerable expertise on the selected topic. The final objective is to publish the proceedings of the conference in order to provide a research base for future public policy decisions. The topic for this conference — the funding of pension plans, particularly public pensions — certainly satisfies all these criteria. We have no doubt that this will be a prominent issue of public policy for some years to come.

The papers prepared for this conference raise two fundamental issues — neither of which has received the public attention which it merits. The first is the massive change in the age structure of our population which raises serious questions as to the ability of future generations to finance public pension programs on a pay-as-you-go basis without levels of taxation which we, the drafters of the present programs, would consider intolerable. The second major issue is the impact of the underfunding of public pension plans on savings and capital formation.

The issue of the funding of pensions would not be as serious if the age structure of the population were reasonably stable over time. However, we know that the decline in the birth rate over the past two decades is going to produce a substantial decline in the ratio of the working age population to the total population in the years ahead. This fact raises serious questions as to the political viability of existing public pension programs if we continue to proceed on a pay-as-you-go basis.

The changing age structure also raises the question of intergenerational equity. Pay-as-you-go financing requires relatively low tax rates now and significantly higher rates in the future to accommodate the rise in the ratio of retirees to workers. A more equitable alternative may be to spread the required tax levy evenly over the generations by accumulating reserve funds now which could be used to pay benefits for future retirees.

There was a time when most economists accepted the doctrine that pension plans tended to increase the level of personal savings. I always found this doctrine difficult to accept, since it was inconsistent with my

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own behavior and that of those around me. This doctrine has been challenged in recent years by two of our participants, Martin Feldstein and Alicia Munnell. There is now a growing recognition that the spread of pension plans does reduce the level of personal savings. This reduction may be offset (or more than offset) by a higher level of institutional or governmental savings, if the pension plans are fully funded. However, if the level of personal savings declines, reflecting an assumption of enhanced personal security, and the pension funds are operated largely on a pay-as-you-go basis, the aggregate level of savings is reduced and, with it, the aggregate level of capital formation. The magnitude of the effect is suggested in Benjamin Friedman's paper in which he finds that a move to full funding of *all* public pension plans would generate such a massive increase in the level of aggregate savings that it probably could not be fully absorbed.

The conference will focus primarily on these two issues: the ability of future generations to finance the liabilities which we have not funded, and the impact of our failure to fund public pension plans on the aggregate level of savings and capital formation. These issues are likely to have a prominent place on the public agenda for a good many years to come.

Demographic Changes and Funding for Pension Plans

William C.L. Hsiao*

Many sectors of the economy have felt the impact of the dramatic decline of birth rates from the post-World War II level that began about 1960. Among the first was our education system. New schools were built and more teachers were trained in response to increases in demand for schooling when birth rates were high. Now the decline in school age population has left many school buildings empty and trained teachers unemployed. The havoc created by the demographic shift has awakened many planners to the need for closer attention to population changes and to raising their time horizon to decades ahead.

Economic planners have rarely looked more than five years ahead. There are several explanations for this lack of long-term planning. First, forecasting with any precision for a long time ahead is impossible. The actual outcome will not likely be realized exactly as forecast. Some conditions can be reasonably projected for the future, while others are open to large errors and much less confidence can be placed on them. However, demographic shifts can be projected with some accuracy for the existing population base.

The yearly increments and decrements to the population have little effect on the demographic composition in any given year. It is their cumulative impact that matters. The population base is large in proportion to any change that occurs in one year. The factors which increase the population — fertility rates and immigration — do not show their cumulative effects until years later. The same can be said for the elements that reduce the population — mortality rates. During the initial period when rates of fertility, mortality, and immigration are fluctuating, their full impact on the demographic composition would not be clear unless the population is examined when it reaches a stationary condition. Yet the life cycle is of such length that it requires 50-75 years to reach the stationary state. Therefore, any analysis of the economic impacts arising from demographic shifts has to look into the distant future. While there are great uncertainties in long-range projections, nevertheless they can provide some indications as to what the future might be if certain predictions based on current trends are realized.

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Pension funds are a significant part of the capital market. At the end of 1975, total assets accumulated by private pension plans were estimated to exceed $250 billion. The implications of demographic shifts since World War II on pension plans — social and private — are examined in this study. Changes in the birth rates have already affected pension funding in the mid-1970s. Their total cyclical impact will last the next 50 years; in the absence of other new demographic shifts, an equilibrium state will be reached in the 2020s.

Two major systems of pensions are in existence today. Social Security provides the largest part of retirement income in the United States. In addition, private pensions play a significant role in the provision of income to retired persons. The role of private pensions will increase with time because more workers are being covered and vesting provisions have been strengthened. As a result, more workers will be eligible for private pensions and for greater amounts.

Pensions, social or private, alter the savings behavior undertaken directly by individuals. Various studies[1] have examined the economic effects of Social Security, and private pension plans. Recent econometric studies tend to show that the net impact of Social Security induces workers to reduce their private savings. Meanwhile private pensions also supplant direct savings by individuals. Their effect on the capital market depends on the funding methods adopted for Social Security and private pension plans. The aggregate savings over time is determined in part by the demographic composition. The potential economic effect resulting from the demographic shift is the subject of this analysis.

Demographic Shift

Like economic conditions, the U.S. population is also ever-changing. Besides migration, there are two major factors that cause population statistics to change. First, the reproduction rate. The statistical method used to measure reproduction is called the fertility rate, which expresses for a given calendar year the number of children that a woman of child-bearing age can expect to have throughout her child-bearing years if the birth rates then currently apply to her and she survives those years. A fertility rate of 2.1 is necessary if a mature population is to remain at the zero population growth.

[1]See Phillip Cagan, "The Effects of Pension Plans on Aggregate Savings: Evidence from a Sample Survey," National Bureau of Economic Research Occasional Paper 95 (New York: Columbia University Press, 1965); Alicia Munnell, *The Effects of Social Security on Personal Savings* (Cambridge, Mass.: Ballinger Publishing Company, 1974); Alicia Munnell, "Private Pensions and Savings: New Evidence" (paper presented at the National Bureau of Economic Research Conference, May 19-20, 1975); Martin Feldstein, "Social Security, Induced Retirement and Aggregate Capital Accumulation," *Journal of Political Economy*, Vol. 82 (September/October 1974).

Since 1900, when reasonably accurate population statistics began to be collected, the fertility rate of the United States has declined steadily. This trend was halted after World War II. After an aberrational bulge which lasted until the end of 1950s, the fertility rate resumed its historical downward course. Table 1 shows that the fertility rate reached the bottom of its trough in 1950, then turned upward dramatically and sustained an upward rate of change until 1957. Since then, the fertility rate has declined sharply. Many demographers had expected the fertility rate to bottom out around the end of the 1960s and remain level thereafter. However, the downward trend continues. Currently the rate is about 1.75, below the replacement rate for zero population growth in the absence of migration.

Undoubtedly the decline in the fertility rates reflects better birth control methods, legalized abortion, the changing role of women, better public education and attention given to family planning, and other changes in life styles.

On the other hand, economic studies published by Richard Easterlin[2] show a "wave" phenomenon in fertility rates. Furthermore, the demand for children by household is a function of economic cycles.

While it is impossible to make accurate predictions of fertility rates for the future, it is difficult to believe that the United States would, in the long run, permit the fertility rate to remain at a level below the zero population growth. The resulting effects such as disrupted social structures, unfulfilled economic expectations and fractured institutions would be so great that public law may well be enacted to remedy the decline in total population. Among the policy instruments which can reverse the downward population trend are immigration policies, child allowances, free child care, etc.

The other major factor that determines the demographic composition is the mortality rate. Mortality rates changed significantly in the 1950s when death rates were declining for infants and for adults over age 50. That decreasing trend leveled off in the early 1960s. Since then the mortality rate has remained relatively level for most age groups. Recently there have been moderate improvements for infants in the South and in other low income areas, and also a slight improvement for older ages. However, without a major conquest of cancer or cardiovascular diseases, mortality rates are unlikely to show any significant improvements.

Funding of pensions is affected by population in two ways. First, the aggregate amount of a pension fund is determined by the number of covered workers. Second, the change in the demographic composition greatly affects the payroll tax rates that are needed to finance the Social Security program. This brings up the question of intergeneration equity. Moreover,

[2]Richard Easterlin, "Does Human Fertility Adjust to the Environment?" *American Economic Review, Papers and Proceedings,* 61:399-407, May 1971. Also Richard Easterlin, *Population, Labor Force and Long Swings in Economic Growth* (New York: Columbia University Press, 1968).

Table 1

FERTILITY RATES OF THE UNITED STATES
1948-1975

Year	Fertility Rate	Year	Fertility Rate
1948	3.11	1962	3.47
1949	3.11	1963	3.33
1950	3.09	1964	3.21
1951	3.27	1965	2.93
1952	3.36	1966	2.74
1953	3.42	1967	2.57
1954	3.54	1968	2.48
1955	3.58	1969	2.46
1956	3.69	1970	2.48
1957	3.77	1971	2.28
1958	3.70	1972	2.02
1959	3.71	1973	1.90
1960	3.65	1974	1.81*
1961	3.63	1975	1.75*

*Based on preliminary data from the U.S. Vital Statistics Report.

Source: U.S. Department of Health, Education and Welfare, Social Security Administration, *Actuarial Study No. 72,* U.S. Government Printing Office, Washington, D.C. 1975.

the shift in the age distribution of the population also alters the total amount of private pension funds.

The demographic shift is illustrated in Table 2. The fertility rate is likely to be the most significant and volatile factor in changing the population composition. Three different fertility rates are used in projecting the population. The first one, assumption A, uses an ultimate fertility rate of 2.1 that will maintain zero population growth. Under this assumption, the population projection shows a continuing increase in the total population of the United States because of the rising number of child-bearing age women and an increase in the fertility rate from the present rate of 1.7 to 2.1.

One very important effect of the low fertility rate is its impact on the retirement dependency ratio — the ratio of people age 65 and over to the working age population. In 1975 that ratio was 0.18. In other words for every 100 people between the age of 18 and 64, there were 18 persons age 65 and over. The retirement dependency ratio will increase steadily over time, but reach a stable level by the early 2020s. By then the ratio is projected to reach 0.27, an increase of 50 percent from 1975. This demographic shift with its drastic change in the retirement dependency ratio is a cause for concern. The implication for pension funding will be discussed in a later section of this paper.

The sensitivity of the fertility rate assumption is illustrated in Table 2. A higher fertility rate of 2.7 would increase the total population by a significant number. Under this assumption, the population would rise sharply. By the year 2025, the total population would increase by 80 percent. Meanwhile the retirement dependency ratio would increase by a moderate amount from 0.18 to 0.23.

Another fertility rate assumption that is used in the sensitivity analysis is the 1.7 rate which closely approximates the current experience. With this rate the retirement dependency ratio increases sharply while the total population rises only slightly.

Demographers have illustrated the change in the demographic composition graphically. The age cohort pyramids for two time periods, superimposed on each other, provide a visual picture of the shift in age composition in the population. If there is little change in the fertility and mortality rates between age cohorts, the pyramid would take the expected triangle shape where the largest group of persons is between age 0-4, then the number of persons will decrease according to the mortality rates. However, the U.S. fertility and mortality rates have been unstable. With the fluctuations in these rates even by year 2025 the population would not have reached a stationary number. The pyramid for year 2025 still has a slight bulge from age 5 to 44. This phenomenon arises from the change in fertility rates. Figure 1 is based on a set of projections which assumes that fertility rates will rise from the current low level to an ultimate rate of 2.1. As the number of women increase and attain child-bearing age, the number of second generation babies will increase. However even by year 2025,

Table 2

PROJECTION OF THE U.S. POPULATION BY BROAD AGE GROUPS

Year	Population (in thousands) as of July 1				65 and Over		Ratio of Persons
	Under Age 18	18-64	65 and Over	Total	Percent of Total	Ratio to Age 18-64	Under Age 18 to Persons Age 18-64
Assumption A— 2.1 Fertility							
1975	66,273	124,847	22,330	213,450	10.5	0.18	0.53
2000	71,079	160,815	30,600	262,494	11.7	0.19	0.44
2025	74,857	176,751	48,105	299,713	16.1	0.27	0.43
2050	78,701	188,448	51,247	318,396	16.1	0.27	0.42
Assumption B— 2.7 Fertility							
1975	66,273	124,847	22,330	213,450	10.5	0.18	0.53
2000	91,152	165,255	30,600	287,007	10.7	0.19	0.55
2025	121,054	212,852	48,105	382,011	12.6	0.23	0.57
2050	158,987	283,767	56,575	499,329	11.3	0.20	0.56
Assumption C— 1.7 Fertility							
1975	66,273	124,847	22,330	213,450	10.5	0.18	0.53
2000	57,322	157,176	30,600	245,098	12.5	0.19	0.36
2025	49,938	152,378	48,105	250,421	19.2	0.32	0.33
2050	44,146	135,532	47,024	226,702	20.7	0.35	0.33

Source: U.S. Bureau of Census, Current Population Report, Series P-25, No. 601, "Projections of Population of the United States: 1975-2050."

not all child-bearing age women would have completed their planned family size. Figure 1 also shows that the low birth rates in the 1930s have been responsible for the small number of people between ages 35-45 in 1975.

But the important point brought out by Figure 1 is that the total number of persons over age 25 is expected to increase between the year 1975 and the year 2025. People over age 65 are projected to increase at a higher rate than persons between ages 25-64. While the retirement dependency ratio is expected to increase, the ratio of dependent children to the working population is expected to decline.

Funding of Pension Systems

Among the important factors which influence the fund development of the pension system are (1) the funding approach that system adopts (2) the changes in the benefit structure and (3) the shifts in the age distribution of the covered population. Besides these elements which affect the funding levels of a matured pension system,[3] the fund of a retirement program is also greatly influenced by transitional changes. Between the time when a pension plan begins to operate and the time it reaches maturity, the proportion of covered older persons to younger persons will increase because of the omission of some of the current aged who are already retired at the start of the program. In addition the benefit amount per retiree, on a constant dollar basis, will rise over the transitional period because benefits are largely based on the length of time contributions are made.

There are, of course, almost an infinite number of variations that can be used to fund a pension system. One common method is the "pay-as-you-go" arrangement. Under this approach, the revenue collected each year is just sufficient to finance that year's expenditures. Frequently, this method is modified slightly by making the contribution schedule slightly larger in order to accumulate a small fund. This fund is used to even out fluctuations in the flow of funds due to economic cycles and unevenness in the time of payments.

However, one actuarial cost method used frequently in funding private pension plans is the entry age normal cost method. Under this approach, the present value of the accrued benefit for each worker is estimated, assuming that each worker enters into the pension system at a fixed age such as age 30. The present value of accrued benefits is calculated with a projection of increases in real wages along with rate of inflation and discounted by the rates of interest, death, disability and rates of termination from employment. Then the funding of the retirement

[3]A matured pension system is defined as one in which the benefit structure has remained relatively unchanged for a long period of time and where the system has been in operation for at least four decades thereby most of the workers have been covered under the pension plan for their working lifetime.

benefits for that individual worker is spread out evenly throughout the expected working life-time of the worker. Under an entry age normal cost method, the funding for a mature pension system will be largely affected by the rise in nominal wages, changes in interest rates, and changes in the age composition of the covered workers.

Funding patterns for a pension system during its transitional period — the date of inauguration to maturity — are seriously influenced by the rapid rise in the benefits being earned and by the approach used to finance the accrued liability for services performed before the inception of the plan. As the number of years that workers contribute to the pension program increases, the benefit earned by new retirees becomes larger. The benefits will grow, in the absence of any revision of benefit structure, until the system reaches a point when most workers have been covered by the plan for their full working lifetime. Similarly, the funding for pension plans will increase under the "pay-as-you-go" method.

During the transitional period, a significant financial liability arises for a young pension plan. Usually benefits are based on the number of years of service that the workers have with the employer. For instance, if a plan provides a retirement benefit that equals 2 percent of the final year's salary times the years of service up to 30, a person who is age 63 and has been employed by that company for 28 years at the inception of the plan would be eligible for retirement pay equal to 60 percent of his final salary. Under an entry age normal funding arrangement, the total benefit for a young worker under age 35 would be financed over a 30-year period. The funding would begin when the worker reaches age 35. Yet for this worker age 63, there would be an initial unfunded past service liability equal to 28 years of contributions accumulated with interest rates and probability of survival until age 63. Many private pension plans amortize this initial liability over a period of 25 to 40 years when they inaugurate a new program. But many other pension plans do not fund this liability. In 1974 Congress passed the Employee Retirement Income Security Act which mandates the funding of the initial past service. The maximum period for amortizing the liability is 30 years (40 years for multi-employer plans and plans established before January 1, 1974).

Demographic Changes and Social Security Financing

Social Security is by far the largest system in the United States that provides income to retired persons. In 1975, more than $40 billion was paid to retirees in benefits.[4] About 90 percent of people age 65 or over received benefit payments.

[4]Social Security Administration, *Social Security Bulletin* Vol. 39, No. 9 (September 1976) Table Q-15, p.90.

Since the 1939 Amendment, the Social Security system has been financed by a "pay-as-you-go" scheme. The revenue collected from the payroll tax each year is intended to equal total expenditures plus a small amount to develop a contingency fund. Currently, the goal is to maintain a fund whose average size is about one year's outlay.

The financing of Social Security depends on an implicit social compact between generations of covered workers. Present workers pay a tax to finance the current benefits paid to retired people. When these workers retire, the next generation of workers will finance the necessary benefits by paying a payroll tax adequate to meet the expenditures then. The inter-generation transfer nature of such a financing scheme can be clearly illustrated by examining the initial past service liability of the system. This valuation is based on a "closed group" concept, under which the program would be continued for present participants but there would be no new entrants and no employer contributions in respect to new entrants. At the end of 1975, the present value of future benefits and expenses for this generation of people over the next 75 years is estimated to exceed the present value of future taxes over the same time period by approximately $4 trillion.[5]

In other words, a large portion of the benefits that will be received by the present "closed group" of people will not be financed and paid by the same group. Instead, these unfunded obligations will be financed by taxes collected from the generation of persons that is yet to be born.

The "pay-as-you-go" payroll tax schedule that is necessary to finance the present Social Security program would be distorted by a flaw in the current program:

The present Social Security benefit formula, legislated in 1972, adjusts benefits automatically to reflect changes in the Consumer Price Index. In addition, the automatic provisions cause the taxable earnings base to rise as average wages under covered employment increase. However, the automatic provisions suffer from an overindexing flaw which will increase benefits to future beneficiaries disproportionately in relation to price and wage increases. According to the Report of the Consultant Panel on Social Security to the U.S. Congress,[6] the outlook is for benefits that will be erratic, a tendency that will be accentuated during periods of high inflation.

There is widespread agreement that this technical flaw in the present benefit formula must be corrected. Although there is no political consensus as to an acceptable alternative, the benefit formula proposed by President Ford in June 1976[7] to correct the overindexing does provide a base by which the impact of demographic shifts on the financing of Social

[5]Data obtained from *Special Analyses, Budget of the U.S. Government, Fiscal Year 1977.*

[6]*Report of the Consultant Panel on Social Security to the Congressional Research Service,* Joint Committee Print., 94th Cong., 2nd Sess., August, 1976.

[7]For details see the "Social Security Benefit Indexing Act," H.R. 14430, June 17, 1976.

Security can be brought out clearly. President Ford proposed that for each age cohort of retirees, their initial retirement benefits replace approximately the same ratio of preretirement wages as applies for a worker who retires in 1976. Under this proposed benefit structure, the changes in the payroll tax rates necessary to finance the retirement and survivor program (excluding disability) will be largely determined by demographic shifts.

The change in the Social Security payroll tax shown in Table 3 is largely due to the shifts in the age distribution in our population. When the retirement dependency ratio increases by 50 percent, then the financing of retirement benefits under a "pay-as-you-go" arrangement would follow that pattern. Meanwhile the portion of our resources allocated to retirement income can be expected to be slightly less for the years 1995-2005. The abnormal decline in fertility rates during depression years will result in fewer retirees at the end of the twentieth century. Accordingly, the projected payroll tax rates for that period would be slightly less than what a stationary population would produce.

Undoubtedly, the economic impact of an increasing Social Security payroll tax arising from demographic shifts will reduce disposable income. According to the projected tax rates in Table 3, the rates may increase by 6-7 percent in absolute terms over the next 50 years. The increase is most pronounced during years 2010 to 2030. If we assume that the marginal utilities of both disposable income and leisure are monotonically decreasing and payroll tax is viewed as another tax,[8] then the effects from reduction in net wage rates depend on the trade-off between the marginal utility of disposable income and the marginal utility of leisure. Although an increase in the payroll tax rate reduces net wages, there is no *a priori* reason to expect that that increase will either decrease or increase the labor supply. Such an effect depends upon the shape of the preference function. Little is known empirically about labor responses to a change in the Social Security payroll tax. Much empirical investigation is necessary.

[8]It is interesting to examine people's beliefs about Social Security which influence their economic behavior. Of course, economists usually treat these factors as exogenous in economic models. Nevertheless it is important to consider consumer beliefs and social values in any economic analysis with public policy implications. Workers generally believe that they have earned their Social Security benefits through their contributions. The system is a forced savings program where the government makes it compulsory for workers to set aside a portion of their wages for retirement. A recent survey (Goodwin and Tu, "The Social Psychological Basis for Public Acceptance of the Social Security System," *American Psychologist*, September 1975, pp. 875-883) reported that in home interviews of a sample of 615 households, most workers believe paying into Social Security is like buying an insurance policy against need in their old age. If the results of this survey are valid, then workers may view the payroll tax not as a tax, but rather as a deduction from wages after taxes, similar to deductions for private pension contributions, health insurance premiums, or other contributions, etc. Accordingly, the way in which workers perceive the Social Security tax can have an important influence on labor supply.

Table 3

PROJECTED EXPENDITURES FOR RETIREMENT AND SURVIVOR INSURANCE UNDER PRESIDENT FORD'S PROPOSAL, JUNE 1976[1]
(Excluding Disability Insurance)

Year	Expenditures as Percent of Taxable Payroll (in percent)
1980	9.17
1990	9.83
2000	9.84
2010	10.35
2020	13.23
2030	15.90
2040	15.84
2050	15.69

[1]Each 1 percent of payroll equals approximately $7 billion in 1977. These projected payroll tax rates are derived with various economic and demographic assumptions. For the short run, the projected rates of inflation and rates of growth in nominal wage rates are those contained in the 1976 President's Budget. For the long run, it was assumed that beyond year 1981, the rate of inflation will be 4 percent per year and wage growth will be 5 3/4 percent per year. The fertility rate is assumed to increase gradually from the present level to an ultimate rate of 1.9 by year 2005 and remain level thereafter. The mortality rate will improve slightly for the next 25 years and then remain stable.

Source: Data in this table are supplied by the Office of the Actuary, Social Security Administration, Baltimore, Maryland, August 1976.

Although the discussion of Social Security and savings is also limited by a scarcity of empirical data, two recent studies[9] indicate that Social Security reduces aggregate savings. Social Security influences savings in two ways. First, the promised benefits of Social Security supplant the need for individuals to save for their own retirement. This substitution effect could reduce savings. Second, Social Security could increase saving through the retirement effect by inducing workers to retire earlier which increases their rate of saving. While these empirical studies differ sharply on how much Social Security has depressed savings in the past, they both agree that the net impact is a reduction in savings and they agree even more on the impact in the future. It is likely that Social Security will reduce savings more drastically in view of the recent large benefit increases and the slowing of the decline in the retirement age. Martin Feldstein's paper, which is included in this volume, provides an analysis of the implication of the "pay-as-you-go" approach to fund Social Security on capital formation in the United States.

Demographic Changes and Private Pension Funding

Changes in the funding of private pensions will be determined largely by three factors: (1) expansion of the number of covered workers, (2) changes in funding requirements mandated by law, and (3) changes in the composition of the population.

Partly because of tax incentives, pension plans have expanded rapidly. They have become important institutional investors in the capital market. Table 4 illustrates the past trend in the growth of pension plans for private employers. Even without ERISA legislation, there is no reason to believe that the rate of growth in pension funds will change significantly from the past.

The number of workers covered by private employer pension plans increased at an average annual rate of 3.4 percent per year since 1960. Of course, this rate of growth is influenced by the size of the labor force. As the working age population increases more rapidly in the future because of the demographic shift plus the continuing upward trend in the female labor participation rates, the number of workers covered can be expected to increase even more rapidly than the past.

Between the years 1960-1970 the assets held by the plans grew at a 10.2 percent rate annually. Meanwhile, the contributions increased 9.8 percent per year while benefit payments rose by 15.6 percent per year. Although the benefit payments are increasing more rapidly than contributions, the net cash flow — contributions minus benefit payments —

[9]See Martin Feldstein, "Social Security, Induced Retirement, and Aggregate Capital Accumulation," *Journal of Political Economy*, Vol. 82, September/October 1974, pp. 905-926 and Alicia Munnell, *The Effects of Social Security on Personal Savings.*

Table 4

PRIVATE EMPLOYER PENSION PLANS,
ESTIMATED COVERAGE, CONTRIBUTIONS,
BENEFIT PAYMENTS AND ASSETS, 1940-1974

Year	Number of Workers Covered (in thousands)	Contributions (in millions)	Benefit Payments (in millions)	Assets (in billions)
1940	4,100	$ 310	$ 140	$ 2.4
1945	6,400	990	220	5.4
1950	9,800	2,080	370	12.1
1955	14,200	3,840	850	27.5
1960	18,700	5,590	1,720	52.0
1965	21,800	8,460	3,520	86.5
1970	26,100	14,000	7,360	137.1
1975	29,800	25,020	12,930	191.7

Source: Data obtained from Alfred M. Skolnik, "Private Pension Plans 1950-74," *Social Security Bulletin,* June 1976, Social Security Administration, Washington, D.C.

is still positive. The explanation lies in the fact that in absolute dollar terms the contributions are still greater than benefits. The assets are increased by the positive net cash flow and by the investment earnings on the assets. Between 1970-1974, in spite of a higher rate of increase in contributions, the rate of increase in total assets slowed down to an annual rate of 8.7 percent, probably caused largely by the drop in stock prices. While net cash flow improved, total assets did not experience more accelerated rates of increase. Thus capital appreciation and investment return on the capital have recently increased at a lower rate than in the period between 1960-1970.

One provision in the Employee Retirement Income Security Act (ERISA) requires the funding of initial past service liabilities. Undoubtedly this will provide an abnormal increase in the amount of contributions to pension funds. Since the accrued benefits for which the contributions are being made are not payable until these workers retire, the aggregate pension funds will rise by these additional contributions by ERISA. This bulge in funding patterns may continue for the next 20-30 years.

The baby boom of the post World War II era has already begun to make its dent in the labor force. Between 1975 and 1985, the number of people between age 18-64 is expected to increase from 125 million to 143 million. This demographic shift towards a higher proportion of people in the working age group will swell the labor force. If the industries provide pensions to their workers and increase their employment at the same rate as the total economy, then workers covered by private pension plans will experience a surge in number with a corresponding increase in contributions. This demographic shift will boost the growth rate of aggregate pension funds.

Yet as the age cohort groups born between 1950-1960 reach retirement age in year 2015 and after, the pension funds will pay out the accumulated funds as benefits. Meanwhile, with the expectation that the lower fertility rate we have experienced will continue, the proportion of active workers will decline. Accordingly, the aggregate contributions are likely to decrease. It seems highly probable therefore that the balance of pension funds will be depressed because the net cash flow — contributions minus benefit payments — may be negative.

Conclusion

A sharp cyclic change in fertility rates since post World War II will have profound effects on the funding of Social Security and private pension plans in the years ahead. This paper discusses two major economic considerations resulting from the demographic shift: intergeneration equity and capital formation.

The fertility rate in the United States halted its steady decline in the late 1940s. The post World War II baby boom is now a well-known fact. The fertility rate reached an asymptotic point in the late 1950s and then again continued on its historical downward trend. Currently the fertility

rate is around 1.75, well below the replacement rate for zero population growth. Over the next decades, this demographic shift will produce a dramatic change in the age composition of our population. Initially the proportion of the retired population to the working population — the retirement dependency ratio — decreases. However, by the turn of the century the retirement dependency ratio will rise rapidly. Its ultimate level is likely to be 50 percent higher than in 1976.

The Social Security program is funded on a "pay-as-you-go" basis. It is a social compact between generations of workers that the present workers will pay a tax sufficient to finance the Social Security benefits for the retired population. When these workers retire, the next generation of workers will finance their benefits by paying a sufficient amount of payroll tax. This method of funding has two serious consequences: inter-generational equity and capital formation.

Under a "pay-as-you-go" funding scheme, a shift in demographic composition has a direct impact on the tax rate required to fund the program. When the retirement dependency ratio is low, the tax rates can be low. And when the retirement dependency ratio increases, the tax rates have to be increased proportionally. For the generation of workers born during the baby boom, the payroll tax rates that they have to pay during their working lifetime are relatively low. But when they reach retirement age, the tax rates required to finance their benefits will have to increase significantly, perhaps by more than 50 percent. These higher tax burdens are borne by the next generation of workers. The inequity between generations is self-evident. It may impair the long-term stability of the Social Security program.

Empirical works by Martin Feldstein and Alicia Munnell tend to show that the retirement benefits provided by Social Security change savings behavior. People tend to save less. Meanwhile, with a pay-as-you-go financing arrangement, the Social Security program does not accumulate a reserve fund that substitutes for the reduction in private savings. Therefore, Social Security affects capital formation in the United States. The demographic shift further aggravates the problem. The current workers save less than they would otherwise save. When they retire, a larger portion of our Gross National Product has to be allocated for their income support because of an increased retirement dependency ratio.

Funding for private pension plans is very different from the one used for the Social Security program. An approach frequently employed is to fund the retirement benefit of workers over their working lifetime. Therefore a reserve fund is accumulated while a person is working and the fund is spent over his retirement years. When the United States experiences a demographic shift, the pension funds would rise while the working population is increasing. However, the proportion of savings provided through private pensions will likely decline when this large working population reaches retirement age.

Discussion

Nathan Keyfitz*

In pension funding with actuarial reserves, such as are offered by private insurers, each person's discounted prospective contributions are equal to his discounted benefits (less office loading), so that each person pays for himself. The sense in which any one individual pays for himself is not that his deductions are equal to his benefits, but rather that expected values are equal, and for large bodies of policy-holders this is what counts. In particular the cohort of people of a given age will come close to balancing deductions and benefits. The next cohort can be much larger or much smaller without this making any difference; as long as the insurer holds the calculated reserves and remains solvent, no problem of equity among cohorts or among generations can possibly arise.

Each cohort gains from the fact that the insurer can put the reserve out at interest, and the interest is for most ages of much more consequence than the gain through some members of the cohort dying before they can collect. The community benefits by having the funds for long-term investment.

In pay-as-you-go there is no reserve beyond a small buffer for smoothing year-to-year operations, and no one pays for himself. Each cohort pays for cohorts that are older than it is. There is no contract between the generations, as there is for holders of the national debt, but each one hopes that when it reaches retirement it will be covered as it covered its predecessors. There is a kind of moral claim: as we paid for our predecessors so our successors ought to pay for us. I shall later make the point that the moral claim will prove tenuous under demographic pressure and we should not lean too heavily on it.

There being no appreciable reserve in pay-as-you-go, there can be no contribution of interest to lighten the load on the scheme. Instead there is something else: a benefit from population increase. By a simple piece of algebra it can be shown that the premiums for pay-as-you-go in a population increasing at rate 100r percent will be identical with the premiums on a reserve scheme with interest at 100r percent, given the same life table, retirement ages, etc. Each individual gains exactly as much on the average from there being $1 + r$ as many individuals the year after on pay-as-you-go as he gains from the fact that the reserve increases in the ratio $1 + r$ on the reserve scheme. I will relegate the algebra to another place, but the result is important; for a population increasing rapidly, say at 2 or 3

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percent per year, the two methods might be chosen indifferently, while for the stationary population the reserve scheme might be preferable. Since the span of years between payment and benefit can be up to 35, interest or population increase could multiply early contributions by a factor as high as four.

It is a shift from an increasing to a stationary population that we are now undergoing in the United States. The change had to come sometime, since nothing can keep rising forever. If we study the table of birth rates provided by Dr. Hsiao, we see that the peak was reached in 1957 and has since been falling. More directly relevant is the absolute number of births, whose peak was reached in 1961. In that year there were 4.3 million births; by 1973 the number was down 3.1 million. If the births had continued upward from 1961 to 1973 at a modest 0.7 percent per year, then we would have had 4.7 million births in 1973, or just 50 percent more than actually occurred. It is the fact that the survivors among the 3.1 million births are going to have to pay pensions of the 4.3 million (or the shadow 4.7 million) that is causing the trouble now so much discussed.

To find the proportion of covered wages that are required at any time on pay-as-you-go is much easier than to calculate reserves. All one need do, in principle, is divide the total pension bill for the given year by the total wages that are taxable. An index of this that is sufficiently accurate to show the demographic aspect is found by taking year by year the ratio of persons over age 65 to persons aged 21 to 65. We should in principle weight according to wages for the working group, and according to pension for the older one, but the unweighted ratio of the table shows the main tendency. It uses the median estimate of the Bureau of the Census and comes to about the same conclusion as Dr. Hsiao.

Evidently the big jump of the past was during the 1950s, when the high births of the late nineteenth century, plus the high immigration around World War I, were factors. Between 1970 and 2000 the rise is slow. A further very large jump of costs comes in the twenty-first century. The peak births of 1961 reach pensionable age in 2026, so that at this time the ratio of pensionables to workers would be at an all-time high and would subsequently decline slightly. The variation over three-quarters of a century is great: a doubling between 1950 and 2025.

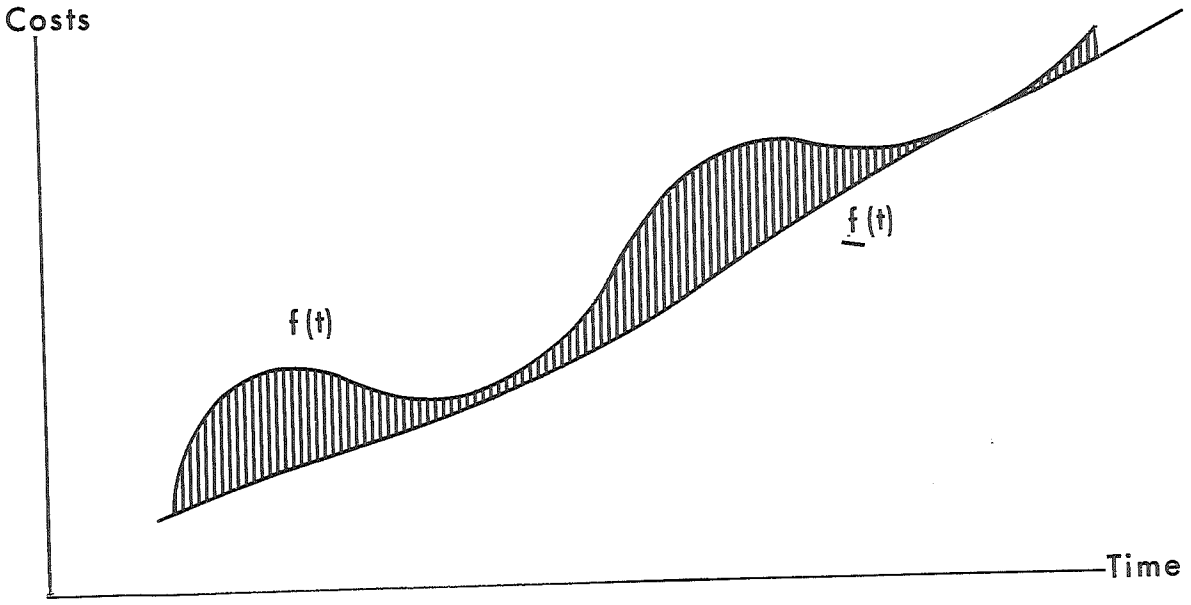
The situation is that of a chain-letter scheme, in which the first receivers of the letter faithfully send their dollars in the hope of recouping later from others, but not enough people can be found to continue the process. The mathematical analogy between pay-as-you-go and the chain letter can be elaborated to cover the case where the body of contributors does not increase fast enough.

Since pensions with actuarial reserves are immune to demographic changes, why not use them? Two difficulties stand in the way. An actuarial reserve scheme makes no provision for those who retire at the start of the scheme, and inadequate provision for those who are well into their working careers. These would be an initial one-time expense that no one

PERSONS OF WORKING AND PENSIONABLE AGES
IN THE UNITED STATES, 1950-2050
MEDIAN ESTIMATE

Year	Age 21-64	Age 65+ (in thousands)	Percent 65+/21-64
1950	85,944	12,397	14.42
1960	92,181	16,675	18.09
1970	103,939	20,085	19.32
1974	110,579	21,815	19.73
1980	122,115	24,523	20.08
1985	131,495	26,659	20.27
1990	137,500	28,933	21.04
2000	148,589	30,600	20.59
2025	146,645	45,715	31.17
2050	147,635	45,805	31.03

Source: *Statistical Abstract of the United States,* 1975, p. 6.



Costs of pensions divided into two parts, shaded $f(t) - \underline{f}(t)$ covered by reserve scheme, $\underline{f}(t)$ by pay-as-you-go.

wants to face. Secondly, it does not seem possible in the presence of inflation so to invest reserve funds as to guarantee a positive real rate of interest. This is a problem that the private insurance companies have struggled with. They know that inflation makes profits in the short run because interest rates received are quicker to take account of inflation than interest paid out, but they also know that enough inflation would destroy them in the long run because people would cease to buy insurance or annuities. No insurance company can be sure enough of its investment skills to offer a contract in real terms, say indexed on consumer prices. Reserve schemes, private or governmental, cannot be affected by demographic change, but they are sensitive to changes in the value of money. Pay-as-you-go is largely proof against inflation, but has demographic troubles.

The main pressure in the United States will come after the end of the century, with a rise of 50 percent over the years from about 2010 to 2020. The only thing that could prevent this is a large increase of births before the year 2000 that would raise the twenty-first century labor force, and this seems unlikely. The weighted calculation cited by Martin Feldstein shows the 30 retirees per 100 workers of today rising to 45 per 100 in 2030. This is the same as the 50 percent increase shown in the table from 1974 to 2025.

The Social Security scheme can be seen as a way of borrowing from future generations, like the national debt. Besides lacking a contractual character, it differs from the national debt in being five times as large. Martin Feldstein shows that the scheme reduces private savings: people do not save as much because they are implicitly promised support by the next generation when they are old. But at the same time their smaller savings mean smaller investment than would otherwise occur, so the incomes of the next generation will be less than with private savings for retirement or an actuarial reserve scheme. Our children's having to pay us larger benefits out of incomes that are smaller than they otherwise would be because of our failure to save may seem reasonable enough to us. After all, we paid for their education, which cost $110 billion for the year 1975 alone, or over $1.2 trillion for those with the average of 11 years of schooling. But with the pensions plus national debt at about $2.4 trillion, fully twice the cost of schooling, the intergenerational exchange may seem unfair to those who come after us.

Since unlike the national debt no legal contract exists between generations, and the Social Security scheme can be changed at any time and in any degree by Act of Congress, one wonders whether our attempt to live off the next generation will ultimately be successful. Whether Congress reduces benefits depends on its calculus of the votes of taxpayers versus the votes of retirees, actual and impending. A scheme that depends on such a calculus is not the most secure that can be devised.

If this is a correct diagnosis of the Social Security demographic problem, the solution is perfectly clear. To anticipate future waves in population, a reserve is needed large enough to equalize the burden on successive generations. Suppose that f(t) is the amount of claim on each dollar

of premium collected, and that it takes on a wave form. Suppose also that a smooth, very slowly rising exponential $\underset{\sim}{f}(t)$ is tangential to its bottom points. Then the part of the claims constituted by $\underset{\sim}{f}(t)$ could be fairly transferred between generations, by which each would pay for the preceding. The excess of prospective claims above $\underset{\sim}{f}(t)$ should be paid for by the generation that is going to benefit from them. For this part each cohort would build an actuarial reserve to cover itself.

Such a scheme would combine pay-as-you-go for the demographically stable part with an actuarial reserve for the demographically variable part. The effect is short of the full reserve, and without more detailed calculation I cannot say whether it would be one-third of the actuarial reserve or more or less. But it would have a major effect on the moral claim of the large cohort to subsequent benefits, and hence on the durability of the Social Security scheme.

The Social Security Fund and National Capital Accumulation

Martin Feldstein*

The Social Security program is almost certain to have a major influence on the Nation's rate of capital accumulation. For most Americans, Social Security is the primary form of saving for retirement. As such, the high and increasing level of Social Security benefits can markedly reduce personal saving and private capital accumulation; the evidence reviewed below suggests that this does in fact occur. The Social Security program also provides the opportunity to offset this reduction in private saving by developing a substantial Social Security capital fund. Indeed, the long-run financial problem that Social Security faces because of the Nation's changing demographic structure will almost certainly require the accumulation of a significant fund during the period of demographic transition.

The primary purpose of this paper is to present estimates of the Social Security fund and the associated contributions to national capital accumulation that would result from alternative tax rates. The analysis shows that even a transitional Social Security fund, i.e., one that is intended only to permit a constant level tax rate for present and future generations, makes an important temporary contribution to capital accumulation. The possible permanent contributions of alternative Social Security capital funds are also analyzed.

To put these simulations into perspective, I shall begin in section 1 with a general discussion of the effect of Social Security on private capital accumulation. The second section summarizes the long-run financial problem of Social Security and the role that a Social Security fund could play in its solution. Section 3 then discusses in more detail the way in which the accumulation of such a fund might operate and reviews the objections to a Social Security fund. The simulations of alternative Social Security funds are presented and discussed in section 4.

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1. *Social Security and Saving*[1]

With our current pay-as-you-go method of financing Social Security, each year's Social Security tax receipts are paid out as concurrent benefits and are not accumulated. There is no real investment of Social Security tax payments, and therefore no interest as such is earned on these compulsory contributions. When we, the current generation of workers, retire, we will not receive Social Security benefits by drawing down an accumulated fund. Instead, our benefits will be financed by the tax payments of those who are at work when we retire.

Because of the growing population and rising level of real wages, the taxes collected in the future will allow us as retirees to receive Social Security benefits greater in total value than the amount we will have paid in taxes while we were working. On average, the level of benefits will be equivalent to receiving a modest real rate of interest on our previous compulsory contributions to Social Security. If there is no further expansion of coverage or of benefit replacement rates,[2] future Social Security benefits will on average reflect a real rate of return equal to the rate of growth of total wage income (i.e., the rate of growth of the labor force plus the rate of growth of the wage rate). With zero population growth, the implicit real rate of return would be about 2 percent; although this seems low, it should be remembered that this is a real after-tax rate of return and therefore about as much as most low-income and middle-income households have traditionally received from personal savings accounts or government savings bonds.

For most Americans, the Social Security program is the major form of saving. Consider, for example, an individual with an income of $10,000 who, in the absence of Social Security, would wish to save 10 percent of his total income for his old age. With Social Security, such an individual would not have to do any saving at all for his retirement. He need save only to buy consumer durables and to have a cash balance for emergencies. Similarly, an individual with an income of $20,000 who, in the absence of Social Security, would want to save 10 percent of his income (or $2,000), finds that Social Security now involves compulsory savings of about $1,600. He would therefore need to save only an additional $400 instead of $2,000.[3]

[1]This section draws on Feldstein (1975, 1976a).

[2]Past increases in Social Security benefits were possible in part because new groups were being added to the covered population. Relatively few workers are now not covered, and the $15,300 maximum causes the tax base to include all of the earnings of 85 percent of covered workers.

[3]This may be saved directly or through a private pension. Many private pensions are adjusted for changes in Social Security and provide very different rates of contribution on incomes above and below the Social Security maximum. This "integration" of Social Security and private pensions is explicitly recognized in the tax treatment of pensions.

In 1975, Social Security contributions for old age and survivors' benefits were $57 billion, or 5.3 percent of disposable personal income. If individuals think of these contributions as equivalent to savings and reduce their own personal savings accordingly, the effect on total savings would be very substantial. In 1975, total private savings, including both personal and corporate saving, were $111 billion.[4] If Social Security did reduce savings by $57 billion, the total potential private savings of $168 billion had been reduced by about 34 percent. If such a reduction in savings occurs every year, the U.S. capital stock would eventually be about 46 percent less than it would otherwise have been.[5]

Because Social Security taxes are not actually compulsory savings, but only an exchange of taxes for an implicit promise of future benefits, it is also useful to look at the likely effect of Social Security on savings in a quite different way. Instead of considering the Social Security contributions, the individual might focus on his expected benefits. Being covered by Social Security is like owning an annuity — i.e., a claim on future annual payments when the individual reaches age 65. Although the individual is not guaranteed these benefits by contract and could in principle be deprived of them by a legislative change, the past experience of the program and the current legislation suggest not only that benefits will continue to be paid, but also that they will increase with the general level of income.[6] These implicit Social Security annuities are an important part of each family's wealth. An individual with such an annuity could reduce his own private accumulation of wealth — whether held directly or through private pensions — by an equal amount.

It is therefore interesting to use the total value of these Social Security annuities as an estimate of the likely effect of Social Security on the total private stock of real wealth. The total value of these annuities reflects the number of workers at each age, their age-specific mortality rates and the mortality rates of their wives, the rate at which per capita income can be expected to grow in the future, and the appropriate rate of interest at which to discount future benefits in evaluating the future annuity benefits. A few years ago I estimated the 1971 value of this Social Security

[4]The private savings rate in 1975 was relatively high for the postwar period. From 1946 through 1975, the private savings averaged 6.7 percent of GNP; by comparison, in 1975 it was 7.4 percent.

[5]This is based on the assumption of a Cobb-Douglas technology with a capital coefficient of one-third; this implies that the equilibrium capital stock is proportional to the saving rate raised to the power 1.5.

[6]Even before the 1972 Social Security law, benefits were repeatedly raised by ad hoc legislation, so that the ratio of the average basic benefit (i.e., the benefit received by a worker with no dependents) to per capita income had fluctuated around 41 percent since the beginning of the Social Security program, with no noticeable trend.

"wealth" at $2 trillion.[7] Since the total private wealth of households in that year was about $3 trillion, the calculation suggests that Social Security may have reduced the stock of private wealth by about 40 percent — i.e., from $5 trillion of wealth that would exist without Social Security to the $3 trillion that currently exists. The 40 percent reduction is remarkably close to the estimate obtained by looking at the reduction in personal savings that would occur if households viewed Social Security taxes as an alternative to savings.

Two caveats must be noted at this point. First, while it is clear that rational individuals who are fortunate enough to have had a basic course in economics might understand the wealth implied by the Social Security program, the typical American household might not behave as this theory predicts. The two preceding calculations showed the extent to which the Social Security program would reduce private capital if households did substitute Social Security "wealth" for private savings, but they did not show that such substitution actually occurs. Second, even if households are perfectly rational in reducing private wealth accumulation by the value of their Social Security "wealth," the effect of Social Security is more complex than the preceding discussion indicated. As I have noted earlier, an important effect of the Social Security program (and especially of the rule that benefits are paid only to those who are effectively retired) is to induce a higher rate of retirement among older persons. But a higher rate of retirement will in itself increase the rate at which people choose to save. A man who plans to continue working until his death need only accumulate enough wealth to support himself (and any surviving dependents) if he becomes unable to work before he dies. If that same man is induced to plan to retire at 65, he will want to accumulate sufficient wealth to provide for this lengthier retirement period. At age 65 a man now has a life expectancy of more than 13 years. Since Social Security benefits are substantially less than earnings, the induced retirement is likely to lead to some additional private savings before retirement.

[7]Feldstein (1974a). This social security "wealth" is not real wealth but only an implicit promise that the next generation will tax itself to pay the annuities currently specified in the law. Although there are no tangible assets corresponding to this "wealth," it is perfectly rational for households to regard the value of their future Social Security benefits as part of their personal wealth.

The relative importance of Social Security "wealth" has grown very rapidly in the past two decades. In 1950, Social Security "wealth" was 88 percent of gross national product. A decade later it had increased to 133 percent of gross national product. Today it is more than 200 percent of gross national product. The impact on capital accumulation is thus more important than ever before.

The U.S. Treasury recently prepared an estimate of $4 trillion for the unfunded liability of the Social Security program. Although the financial liability as such is not important, the $4 trillion is significant as an estimate of the value of Social Security wealth as perceived by households.

The net effect of the Social Security program will therefore depend on the balance between the extra savings due to induced retirement and the reduced savings due to the replacement of private accumulation by Social Security "wealth."[8] The relative strength of these two effects will, of course, depend on the magnitude of the increase in retirees due to the Social Security program. In 1929, 45 percent of men over the age of 65 were retired. By 1971, the retirement rate had increased to 75 percent. Although the higher rate of retirement also reflects higher income, changing life expectancies, and a different occupational mix, the Social Security System is probably responsible for some of the increase in retirement. Nevertheless, it is clear that even if half of the increase in retirement were attributable to Social Security, the reduction in savings due to the replacement of private wealth by Social Security "wealth" is almost certain to be much greater than the effect on savings of induced retirement.

Evidence is now beginning to accumulate to support this conclusion about the adverse effect of Social Security on aggregate national savings. In the first direct test, I examined savings behavior in the United States from 1929 to 1971 (Feldstein, 1974a). The analysis employed a generalization of the consumption function specification that Ando and Modigliani (1963) had used to test the traditional life-cycle model. I reasoned that the effect of Social Security was most appropriately represented by the present actuarial value of the retirement and survivor benefits to which the current adult population was entitled, i.e., by Social Security wealth.

The Social Security wealth variable should play the same role in the aggregate consumption function that is expected of the ordinary "fungible wealth" variable: a higher level of wealth should increase current consumption and decrease current saving. In addition to this direct effect, the growth of Social Security wealth should increase retirement and thus stimulate saving. The coefficient of the Social Security variable should therefore reflect the net effect of these two influences.

The statistical estimates indicate that Social Security does reduce private saving. The estimated marginal propensity to consume Social Security wealth was generally significantly positive and not significantly different from the coefficient of ordinary wealth. The implied magnitude of the effect of Social Security on saving is therefore very large. The point estimate of the coefficient of Social Security wealth indicates that personal saving in 1971 was approximately halved by Social Security, implying a reduction in total private saving (including corporate saving) of 38 percent. When the sample was restricted to the period since 1947, the coefficients remained quite similar but the standard errors became so large that the effects of both ordinary wealth and Social Security wealth were

[8] I have discussed these offsetting effects more formally in Feldstein (1974a, 1976a, 1977b) in the framework of what I have called the extended life-cycle model.

insignificant. This evidence thus provides preliminary support for the conclusion that Social Security substantially depresses saving, but indicates the need for research with new bodies of data that can provide more precise estimates.

The time series data were subsequently analyzed in a number of interesting ways by Munnell (1974a, b). She tested the effect of retirement explicitly by modifying the consumption function with Social Security wealth to allow the marginal propensity to consume out of disposable income to vary with the labor force participation of men over 65. Although this provides a very imperfect measure of the expected future retirement of current workers, the interaction variable always had the expected sign. With this method of adjusting for the induced retirement effect of Social Security on saving, the coefficient of Social Security wealth was closer to an estimate of the pure wealth substitution effect; Munnell's coefficient of Social Security wealth was nearly 50 percent greater than my estimate was in an equation that did not try to separate the effect of induced retirement. Munnell's decomposition also permits explicit estimates of the way in which the Social Security wealth replacement effect and the general increase in retirement have had offsetting effects on aggregate saving: in 1969, according to her estimates, Social Security wealth reduced personal saving by $54 billion while the greater retirement since 1929 increased saving by $26 billion.[9] In interpreting these figures it would of course be wrong to regard all of the impact of the increased retirement to be the indirect induced retirement effect of Social Security. Much of the increased retirement would no doubt have occurred simply because of higher incomes, urbanization, the decline of self-employment, the depression, etc.; a simple extrapolation of the geometric rate of decline in the labor force participation of older men from 1900 to 1929 can account for nearly 75 percent of the increase in retirement from 1929 to 1969.

A quite different type of evidence supporting the extended life-cycle model is provided by an analysis of intercountry differences in saving rates. Modigliani (1970) has shown that the pattern of intercountry differences in private saving rates is consistent with the predictions of the traditional life-cycle theory: higher saving rates in countries with higher rates of economic growth and higher proportions of the population of working age. To assess the effect of Social Security, Feldstein (1977b) added measures of retirement behavior (the labor force participation rate of men over 65 and the life expectancy at age 65) and of the substitution effect of

[9]This calculation is based on the first equation of Table 3, p. 562 of Munnell (1974a). It differs from Munnell's estimate which is based on her strange and extremely narrow concept of "retirement saving" which she defines to include only the increase in the net assets of life insurance companies and of private and government pension plans; by ignoring most forms of saving, Munnell greatly underestimates the saving effects of both Social Security wealth and changing retirement behavior. Her later work (Munnell, 1976a) uses only the more traditional definition of saving.

Social Security (the ratio of Social Security benefits per aged person to average income per capita). The coefficients of these variables had the predicted signs, were statistically significant in a variety of specifications, and accounted for a substantial portion of the variation in the saving rates of the 15 developed countries in the sample. In particular, the coefficient of the Social Security variable implied that the average level of Social Security benefits reduced the saving rate by 4.2 percentage points or one-third of the average private saving rate; similarly, an increase in relative Social Security benefits from one standard deviation below the mean to one standard deviation above reduced the private saving rate by 5.4 percentage points.

This of course reflects only the partial wealth replacement effect of Social Security since retirement is held constant statistically. However, the evidence indicates that the wealth replacement effect is much more important than the induced retirement effect. The net effect of Social Security implies that the average level of Social Security benefits reduces the saving rate by 3.5 percentage points, more than four-fifths of the pure wealth replacement effect.

The use of microeconomic household data to measure the impact of Social Security is just beginning. Munnell (1976a) analyzed data collected by the National Longitudinal Survey of the Department of Labor and studied saving defined as the change in net worth over a three-year period. She found strong evidence that men aged 45 to 65 substantially reduce their own saving if they are covered by Social Security or by a private pension. Her analysis used an extended life-cycle model that explicitly included the expected time to retirement and life expectancy after retirement, but there was no specific test of the effect of differences in expected retirement date. Because Social Security now covers almost everyone (the exceptions are almost all government employees or railroad workers with their own pension programs), the estimated effect of Social Security coverage is difficult to interpret. It is reassuring therefore that Munnell finds that saving is reduced by private pension coverage and varies inversely with crude estimates of pension benefits and Social Security benefits.

This finding is supported by a new study using different microeconomic data and a quite different method of analysis. Feldstein and Pellechio (1977) relate the value of household assets (rather than saving) to Social Security wealth. The analysis, which uses the 1962 Federal Reserve Board *Survey of Consumer Finances,* finds strong evidence of the substitution of Social Security wealth for other assets of those nearing retirement age (i.e., those age 55 to 64) although more ambiguous results for younger persons.

The effect of Social Security on private saving also explains the surprising fact that the concentration of wealth as traditionally measured has remained stable during the past 50 years in spite of strong economic pressures toward greater equality. Simon Kuznets (1956) calculated that the top 1 percent of the population received 15.6 percent of disposable income

in the 1920s but only 7.7 percent in 1946 (the last year of his analysis). Although exactly comparable figures are not available for more recent years, there is no evidence of an increasing concentration of income and some evidence that the share received by upper income families has continued to decline. In contrast, Robert Lampman's (1962) classic study concluded that the share of wealth held by the top 2 percent of families varied only from 32 percent in 1922 to 29 percent in 1953; more recent evidence shows no decrease in concentration in the 1960s. It seems at first a paradox that the concentration of wealth has remained unchanged in spite of the reduced concentration of income and the rapid increase in estate and gift tax rates. The paradox is easily resolved, however, by recognizing that the vast majority of middle-income and lower-income households have substituted Social Security wealth for ordinary fungible wealth. I used the 1962 Federal Reserve Board *Survey of Consumer Finances* to compare the distribution of fungible wealth (i.e., excluding Social Security) with the distribution of total wealth including a detailed estimate of each family's Social Security wealth (Feldstein, 1976c). The results show that the distribution of total wealth is much less concentrated than the distribution of fungible wealth and has therefore become much more equal during the past half century. For example, the top 1 percent of families with a head between 35 and 64 years old owned 28.4 percent of fungible wealth but only 18.9 percent of total wealth.

Finally, the expected impact of Social Security is supported by the general aggregate evidence on the long-term trend in net capital accumulation. Kuznets (1961) reported that the ratio of net capital formation to net national product averaged 12 percent during the 60 years ending in 1928.[10] In the 30 years since World War II, the ratio of net capital formation to net national product has averaged only 7.7 percent.[11] While this fall in the net saving rate no doubt reflects a great many changes in the Nation in the past 50 years,[12] it is certainly consistent with the view that Social Security has reduced real capital accumulation.[13]

With less capital accumulation, there is a lower level of productivity and therefore a lower national income. The parameter estimates in my

[10]More specifically: 1869-1878, 12.5 percent; 1879-1888, 12.1 percent; 1889-1898, 13.2 percent; 1899-1908, 12.9 percent; 1909-1918, 10.4 percent; 1919-1928, 10.1 percent.

[11]See Feldstein (1977c) for a description of these data and a more detailed analysis. Government deficits decreased the postwar rate of net capital accumulation, but by less than 1 percent of net national product.

[12]As Kuznets has written: "The general answer to the question as to why savings-income ratios failed to rise with the secular rise in real income per capita is quite simple: because the whole pattern of economic and social life changed." (Kuznets, 1952, p. 522)

[13]The fall in the gross saving rate has been much less sharp but is clearly perceptible in the data: a fall from more than 20 percent before the depression to less than 16 percent in the postwar period. See my discussion of this evidence and of the study by David and Scadding (1974) in Feldstein (1977c), part 1.

study of U.S. time series data implied that Social Security would eventually reduce the U.S. capital stock by some 40 percent of what it would otherwise have been. If the Nation's capital stock is now 30 percent lower because of Social Security, national income is reduced by about 11 percent or, for 1975, $165 billion.[14] To put this number in perspective, note that $165 billion was nearly one-fifth of total consumer spending and nearly equal to all of gross private domestic investment. Viewed somewhat differently, $165 billion is $750 per person or more than $2,000 per family. Let me emphasize that this reflects the pay-as-you-go nature of the Social Security System and not Social Security as such.

The important effect of the reduction is not however the fall in income or wage rates. The reduction in national wellbeing comes from foregoing the opportunity to invest in real capital with a rate of return to the Nation of 12 percent and substituting instead a very low-yielding implicit intergenerational contract.[15]

2. *Social Security's Long-Run Financial Problem*

Although the effect of Social Security on the Nation's rate of capital accumulation might, unwisely, be ignored, there are financial problems that must be faced.[16] In the near future, it will be necessary to correct the "double indexing" of benefits to inflation that was erroneously introduced in 1972[17] and to raise taxes by enough to eliminate the current deficit;[18] in order to discuss the future sensibly, I will assume that both of these short-run problems are solved. It is on the remaining long-term financial problem that I will concentrate.

[14]The calculation assumes a Cobb-Douglas technology with a capital coefficient of one-third.

[15]The nature of the welfare loss is discussed in some detail in Feldstein (1977c, section IIB). See also Feldstein (1977a).

[16]The issues discussed in this section are dealt with more fully in official reports by Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds (1976), Consultant Panel on Social Security (1976) and Quadriennial Advisory Council of Social Security (1975) and in unofficial studies by Feldstein (1975, 1977d), Kaplan (1976), and Munnell (1976b).

[17]While adjusting benefits and taxable wages for inflation is clearly a good idea, it is generally agreed that the method used was technically wrong. It makes real benefits and taxes hypersensitve to inflation. As far as I know, all Social Security experts believe that the current method of indexing should be corrected.

[18]This is perhaps an appropriate point to stress that the popular concern about the possible bankruptcy of Social Security is based on a fundamental misunderstanding. It is true that the Social Security System has a trust fund of only about $40 billion and obligations of about $4,000 billion; by the conventional standards used to determine the actuarial soundness of private pension programs, Social Security would be judged bankrupt. But this analogy of Social Security to private pension programs is totally misleading. There is no economic reason why Social Security should ever be bankrupt. The government's power to tax is its power to meet the obligations of Social Security to future beneficiaries. As long as the voters support the Social Security System, it will be able to pay the benefits that it promises.

Table 1

TAX RATES TO FINANCE CONCURRENT BENEFITS

Years	Benefits Based on Wage Indexing[1]	Benefits Based on Price Indexing[1]
1976-1980	10.74	10.70
1981-1990	11.19	10.49
1991-2000	12.25	10.28
2001-2010	12.80	9.85
2011-2020	15.00	10.76
2021-2030	17.99	12.20
2031-2040	18.99	12.10
2041-2050	18.76	11.51

[1]"Wage indexing" refers to the method of inflation adjustment proposed in Department of Health, Education and Welfare (1976), while "price indexing" refers to the method of adjustment proposed by the Consultant Panel (1976).

Source: Estimates of benefits and taxable wages were prepared by the Social Security actuaries for the Board of Trustees 1976 Report and for the Consultant Panel.

The problem and its causes can be summarized very briefly. To maintain the current structure of benefits and the pay-as-you-go method of finance would require the Social Security tax rate to double over the next 50 years. This is a result of the changing demographic structure of the population and the maturing of the Social Security program. A short explanation of each is in order.

The birth rate has dropped dramatically since 1960 at every age level. The total fertility rate, i.e., the average number of babies born per woman in her lifetime, remained above 3.0 from 1947 to 1964 and then declined sharply and continuously to less than 2.0 today. A rate of 2.1 is required just to maintain the population at its current size over the long run. Even if the fertility rate were to rise immediately to this zero population growth value of 2.1, the demographic structure of the population would still change markedly over the next 60 years because of the demographic swing from baby boom to baby slump that has already occurred.

Today there are 30 retirees per 100 workers. The Social Security actuaries now estimate that even if the fertility rate were to rise rapidly to the zero population growth rate of 2.1, there will be 45 retirees per 100 workers in the year 2030. If the current pattern of benefit replacement ratios (i.e., the ratio of benefits to previous earnings) is to be maintained, the tax rate would also have to rise by 50 percent, from 11 percent to more than 16 percent.[19] Although this simple proportionality is only an approximation of the more complex calculation that will be examined in section 4 below, it does illustrate the powerful effect of the changing demographic structure.

The maturing of the Social Security program is important because it implies that the high implicit "rate of return" that retirees have, until now, received on the taxes that they paid will be very much lower for those who retire in the future. Although it is still not understood by the general public, readers of this paper know that the secret of Social Security's ability to pay back more in benefits than the retirees (and their employers) previously paid in taxes is not the productivity of capital investment but the growth of real Social Security tax revenue. Its rapid growth for the past 30 years has had four separate sources: the rise in average weekly earnings, the growth of the labor force, the expansion of Social Security coverage and the fivefold increase in the tax rate.[20] Although real wage rates will continue to rise, none of the other sources of tax revenue growth can continue to expand as they have in the past. When the tax

[19]The 11 percent rate is the total rate required to finance the 1976 benefits for old age, survivors and disability insurance. The 9.9 percent combined rate paid by employers and employees represents a deficit level. An additional 1.8 percent is paid for health insurance. I shall always refer to the combined employee-employer rate.

[20]The tax rate has increased from 2 percent in 1937-49 to 9.9 percent today with an additional 1.8 percent for health benefits.

rate, the coverage and the population have stabilized, the "rate of return" that participants earn on their Social Security contributions will be limited to the growth rate of real wages, at most about 2 percent per year.

The financial consequences of the demographic change and of the maturing of the system can be summarized by the changes in the tax rate required to finance each future year's benefits *on a concurrent basis.* For this purpose, I assume that the current faulty method of indexing is corrected in the way proposed by the Department of Health, Education, and Welfare (1976). The HEW proposal bases benefits on previous relative wages and thus makes the ratio of the retiree's benefits to his previous earnings depend on his previous relative position in the distribution of earnings and not directly on his previous real income. The importance of "wage indexing" instead of price indexing is discussed below. The tax rates required to finance future benefits are shown in the first column of Table 1. Decade averages are presented for the entire period for which Social Security Administration actuarial estimates have been prepared.

The projected tax rate rises from the current value of 9.9 percent to more than 19 percent in the decade 2031-40. Even 35 years from now, the projected rate already reaches 15 percent. By promising the current structure of benefits and by relying on pay-as-you-go financing we are trying to impose these very high tax rates on future generations of workers and taxpayers. There is a serious moral question of whether we have the right to impose such a burden on future generations. There is also the important practical problem that those future generations may reject the "obligation" to pay a higher tax rate than we ourselves are willing to pay. The marked fall in the "rate of return" that I noted above will make Social Security less of a "good deal" for participants than it was in the past and will thereby reduce political support for a large Social Security program. When labor and management see that they can get a much higher return from private pension plans, their support for Social Security will turn to pressure for a reduced program that concentrates on providing a more minimal level of benefits. In short, planning for a sharp increase in tax rates courts the danger that future retirees will not receive the benefits that they had anticipated.

A second important problem with high future tax rates is that, to the extent that they actually occur, they raise the overall marginal tax rate (including income and sales tax) of middle-income and low-income households. The higher Social Security tax rate thus exacerbates the distortions and disincentives already produced by our current tax system. A specific example will illustrate this point. A family of four in Massachusetts with earnings of $12,000 in 1976 currently pays a combined marginal tax rate of about 36 percent on any extra earnings. This is equivalent to paying an extra $56 in taxes for an extra $100 in after-tax consumption. A 10 percent increase in the Social Security tax would raise the marginal tax rate to about 46 percent, implying an extra $85 in taxes for each extra $100 in

after-tax consumption. Such high tax rates would undoubtedly have substantial distorting effects on work effort, job choice, etc.[21]

The sharp increase in tax rates implied by the HEW proposal is undesirable and is in fact unnecessary. There are two alternative policies that eliminate the need for such a future increase: developing a Social Security fund and modifying the method of inflation adjustment to make benefits depend on real wages rather than relative wages. Both are good ideas and both might be done together. The next section will discuss some of the alternative ways of developing a Social Security fund. The current section will now conclude by describing the method of price indexing recently proposed by the Consultant Panel on Social Security (1976) in its report for the U.S. Senate Committee on Finance and the U.S. House Committee on Ways and Means.

The essential feature of their proposal is to make future benefits and replacement ratios depend on the previous real income rather than the relative income of the retirees. This is done by using earnings that are indexed by the price level during the earnings period for the purpose of computing benefits. The mechanics of this method are less important for the current discussion than the reason for and the effect of relating benefits to real earnings. It has always been a principle of Social Security that individuals with higher lifetime average earnings and contributions should receive higher benefits. It has also been a principle that the replacement ratio (i.e., the ratio of benefits to preretirement earnings) should decline with income. For example, a new retiree in 1976 who has always had median earnings (now $8,500) and who has a dependent wife will get benefits that replace 69 percent of his previous gross wage. In contrast, someone who has always had maximum earnings (now $15,300) will get a lower replacement, about 45 percent including the dependent's benefit. Thirty years from now, a man who has had median earnings all his life will be earning about $15,500 (measured in the prices of 1976). With this increased income it would not be appropriate to continue the 69 percent replacement rate currently given to the median worker with a dependent.[22] This would produce a benefit of nearly $11,000. It would be more appropriate to recognize that a lower replacement rate is appropriate at that higher real income. With the 45 percent replacement currently paid to someone with that real income level, tax-free benefits would be $7,000 a year.

[21]The effect depends not merely on the tax but on the perceived link between taxes and benefits. A greater perceived redistribution and a lower perceived rate of return increase the adverse incentive effects of the high Social Security payroll tax; see Feldstein (1977e).

[22]Continuing the current replacement rates at each level of *relative* income is a characteristic of the HEW proposal. The choice between the two proposals can be regarded as essentially a choice between making *replacement ratios* depend on *relative income* versus *real income.*

Using the price indexing method to relate benefits to real income would make aggregate benefits rise much more slowly in the future than they would with the relative income method of wage indexing. The estimated tax rates required to finance the concurrent year's benefits are shown in column 2 of Table 1. They rise to a maximum of only slightly more than 12 percent in comparison to the 19 percent required for the wage indexing method.[23] These lower tax rates obviously entail lower benefit levels and therefore arouse political opposition from those who oppose any reductions in benefits. A comparison of columns 1 and 2 suggests that someone who is now 40 will save relatively little in taxes during the next 25 working years if price indexing (column 2) is adopted instead of wage indexing (column 1) but would receive substantially lower benefits during the retirement years that follow. For those already retired in 1976, the lower tax rates permit no personal saving while the lower benefits are seen as a personal cost. The political outcome may therefore force us to think about financing the wage-indexed benefits associated with column 1 or, at best, some compromise between columns 1 and 2.

Even if column 2 type pure price indexing did become the rule, there would still be the need for rates to increase by about one-fourth of the current 9.9 percent to compensate for the increased ratio of retirees to workers. Moreover, Table 1 is based on the optimistic assumption that productivity and real wages will contrive to rise at 2 percent a year. If that increase is limited to 1.75 percent,[24] the tax required with price indexing would rise to 13.1 percent instead of 12.2 percent and with wage indexing to 19.9 percent instead of 19 percent. A continued reliance on pure pay-as-you-go financing inevitably entails a substantial increase in the tax rate at some time in the future.

3. *Accumulating a Social Security Fund*

To eliminate our dependence on a large tax increase self-imposed by future voters, we should begin now to accumulate a fund in anticipation of the demographic bulge ahead. We can do this by raising taxes ourselves during the next decade by more than is required to finance the concurrent benefits. This would yield a surplus that could be invested to develop a Social Security fund.

Although there are many possible ways of developing a Social Security fund, the basic principle in all of them would be quite simple: the fund would invest the Social Security tax receipts in excess of benefits in

[23] I believe that this price indexing method also has other valuable features that are not relevant for the issue at hand; these are discussed in Consultant Panel (1976) and Feldstein (1977d).

[24] Average real weekly earnings before tax have grown during the past 25 years at an annual rate of 1.3 percent; if we disregard the recession of 1974 and 1975, the 23-year growth rate was 1.7 percent.

previously outstanding government debt by purchasing government bonds from private investors. The net interest received by the Social Security fund would also be reinvested by purchasing such existing privately held government debt. When the demographic bulge finally arrives, the fund could be run down by paying benefits in excess of tax receipts.

A crucial feature of the fund proposal is that the annual surplus (i.e., the excess of taxes and fund income over benefits paid) should be invested in existing government debt held by the public and not merely used as a method of allowing the government to increase its deficit and issue new debt. By investing only in previously outstanding debt, the Social Security fund induces portfolio investors to substitute new private securities for the government debt that they have sold. In this way, the accumulation of government debt by the Social Security fund can lead to the accumulation of an equal amount of real capital owned by private investors. The Social Security fund therefore not only mitigates the long-term financial problem but also offsets the adverse effect of Social Security on private capital accumulation.[25]

Recognizing this role of a Social Security fund in offsetting the fall in private saving suggests that the appropriate size of the Social Security fund might be more ambitious than is required merely to get through the demographic bulge without an extra increase in the tax rate. The next section examines three alternative goals for a Social Security fund, ranging from just financing the demographic bulge to accumulating a significant permanent capital fund and finally to accumulating a fund that is large enough to endow the future financing of Social Security benefits. Any of these fund plans would be desirable as an offset to the low rate of capital accumulation and as a way of avoiding the dependence on a sharp future increase in taxes.[26] The next section analyzes the financial and capital accumulation implications of all three alternatives.

I have already stressed the fact that although the Social Security fund is invested in government debt, it has the indirect effect of adding to the Nation's real capital investment. The return that society earns on this additional saving is substantially higher than the real interest rate paid on government debt. Long-term government bonds now pay a nominal interest rate of 7 percent. An optimistic inflation forecast of 4 percent for the same horizon implies a real financial yield on government debt of only 3 percent. By contrast, additional investment in the corporate sector capital

[25]In this discussion and everywhere else in the current paper, I assume that full employment is maintained. In particular, I assume that investment will rise to absorb extra savings, perhaps with the help of more favorable tax policies for investment income. I recognize that a large sudden increase or decrease in saving would have unsettling short-run effects and that any major change in the saving rate should therefore be accompanied by an appropriate mix of monetary and tax policy during the period of transition.

[26]I do not want to discuss here the explicit welfare economics of why a Social Security fund would be desirable or, equivalently, why it would be desirable to increase capital accumulation by a government surplus. See however, my comments in Feldstein (1977c, part II).

stock yields a pretax return to the Nation of about 12 percent.[27] The Social Security fund might be operated to reflect this high national yield by a direct subsidy from general tax revenue to the fund in proportion to the interest that the fund receives on its portfolio of government bonds. The next section examines three of the many possible rules for imputing the national benefits of extra investment to the Social Security fund and of adjusting the tax rules accordingly.

Before looking at these return-reinvestment rules and their implications in detail, I would like to consider briefly the objections that I have heard in response to the general idea of any Social Security fund. I will discuss the five arguments that I have heard most frequently:

1. It is often alleged that accumulating a Social Security fund would not add to real capital accumulation. Nancy Teeters, now a senior Congressional Budget analyst, provides a very clear statement of this view:

> A private pension plan can transfer resources over time for the individual by currently investing in productive capital that produces real income in the future, whereas the social security surpluses are invested in government securities. The interest on those government securities is a government expenditure that must be financed from current revenues. Creating near-term surpluses to build up large trust funds that will generate large interest payments in the future does not reduce the burden of supporting the dependent population in the year that it occurs. The existence of large trust funds only determines whether the cash-benefits program is going to be financed out of payroll taxes or out of general revenues used to pay the interest on the securities held by the trust fund.

There are two common and crucial errors in this paragraph. Consider what actually happens when the Social Security program has a surplus with which it buys outstanding government securities on the open market. First, the future interest payments on that debt are paid to the Social Security program instead of to the private individuals who previously owned the government bonds. Therefore, contrary to the implication of Dr. Teeters' statement, there is no need for additional taxation to make extra interest payments. And the Social Security program has interest income that permits it to lower the payroll tax and yet still provide the same level of benefits. The burden on the future generation of taxpayers is thus lighter. Second, the private individuals who originally sold their government bonds to the Social Security fund will invest the proceeds in private bonds and stocks. This additional demand for private securities will increase the

[27]See Feldstein and Summers (1977) for an analysis of the evidence on the rate of return in the postwar period. Unlike Nordhaus (1974), we find no indication of a secular decline in the rate of return. See also the summary in Feldstein (1977a).

funds available for private investment, and extra private investment increases the real capital stock and raises future income. In this very real sense, a Social Security trust fund can transfer resources over time and reduce the tax burden on future generations.[28]

2. There is still a vestige of the early Keynesian fears that a Social Security surplus would produce excess savings and serious recession.[29] These concerns have inappropriately been carried from the Great Depression into the present decade. Now our capital market would have no difficulty in adjusting to an increasing rate of savings. With more capital available for investment, the cost of capital would fall; firms would introduce more capital-intensive techniques of production, and would provide more good jobs in capital-intensive industries. There is no reason why the United States cannot absorb savings at the same high rates that other developed countries can.

3. Some who would otherwise favor an increase in capital accumulation fear the excessive interference of a Social Security fund with the private economy. There would be grounds for such concern if the accumulation of a Social Security fund required ownership of physical capital or equity shares in private companies; however, such investments are not necessary. There is currently more than $500 billion of privately held government debt (including the debt of state and local governments) and more than $200 billion of additional bonds issued or guaranteed by government agencies. Private mortgages and corporate bonds might provide further means for channeling funds to the private capital market without becoming involved in management or equity ownership.

4. Accumulating a surplus in the near term requires raising the Social Security tax rate. This is seen by some as unfair or excessively burdensome. It must be remembered, however, that the Social Security tax is already scheduled to increase substantially in the future in order to deal with the changing demographic structure of the population. By raising the tax rate now, the eventual total increase can be reduced, since the interest income of the Social Security fund will be available to pay part of the cost of future benefits. If we do not raise the tax rate now, we will be placing an unfair burden on the next generation — asking them to pay a much higher tax rate to support us than the rate we charged ourselves. And if they refuse to shoulder this burden, and to tax themselves more heavily than we are now taxing ourselves, the benefits that we receive will be very much smaller than we now expect.

[28]If some portion of these extra private funds is invested abroad or replaces foreign investment in the United States, the social rate of return on them may be lower than otherwise. This occurs when a foreign government collects part of the return in its business income tax, or when the United States loses corporate tax receipts on displaced foreign investment. But the additional investment still transfers resources over time in a productive way and thus alleviates the burden on future generations.

[29]In 1941, Seymour Harris, one of the pioneer Keynesians in America, praised the ability of the Social Security program to reduce total saving.

5. Finally, there are some critics who object to lodging such a fund in the Social Security agency rather than in the Treasury or in some other government department. I recognize that there is no compelling economic logic for assigning this responsiblity to Social Security. But historically and politically, the Social Security System has been viewed as a substitute for private savings and private pensions. The Social Security agency is therefore the natural place in the government structure in which to locate a public savings or pension fund. Adding to the already existing Social Security fund should raise none of the ideological or political objections that might be aroused by the creation of a new government investment agency. It is not just coincidence that in other countries the ownership of a large public capital fund has been specifically vested in the Social Security agency.

4. *Simulating the Development of Alternative Social Security Funds*

When I first started writing about this subject, I thought of a substantial Social Security fund as an economically wise but politically unlikely goal. In contrast, I now believe that some such Social Security fund will become a reality because of the financial pressures on the Social Security program and that its political support will probably be quite unrelated to its economic wisdom. A fund will permit dealing with the demographic bulge without a sudden shift in the tax rate. Our sense of fairness requires that the next generation not be asked to pay a higher tax to support us than we have been prepared to pay to finance the same replacement rates. Our sense of prudence should reinforce this decision not to depend on the willingness of others to raise their own taxes. If these considerations lead to a level tax rate, they will in turn entail the development of a Social Security fund.[30]

This section presents summary descriptions of simulations of the development of alternative Social Security funds. The simulations indicate the level tax rates required to achieve each of the three alternative fund goals that I mentioned above. In discussing the simulation results, I shall emphasize the contribution of the fund to the capital stock and to national saving. It is useful to begin by describing the features that are common to all of the simulations; the nature of the differences among the simulations will then be outlined.

[30]The Consultant Panel suggests coupling its price indexing proposal with a constant level tax rate of 10.3 percent. Although this involves a deficit in the short run, there is a surplus starting in the year 1996 which causes the Social Security fund to grow until the decade beginning 2010. The fund is then depleted by the demographic bulge and is actually exhausted before the year 2030. The HEW proposal calls for a level 10.5 percent tax rate until the year 2010 followed by a level 12.5 percent rate; such financing is at best hypothetical since the fund would in fact be exhausted before 1990.

All of the simulations are based on forecasts of benefits and of taxable payroll prepared by the actuaries of the Social Security Administration.[31] These forecasts entail a whole range of specific assumptions about the size of the future population, the rise in real wages, the rates of future labor force participation and retirement, etc. Projecting such variables for 75 years into the future provides ample scope for error. Perhaps the most that can be said is that these figures provide a convenient framework and are regarded by the Federal Government as the best that can be done with available information. Because the proposals that are examined here adjust for changes in the price level (or nominal wage level), the results are not affected by errors in the forecast of future inflation rates; only the growth of real wages really matters. The simulations assumed that real wages rise at 2 percent.[32] The age specific fertility rates are projected to rise rather rapidly to a total fertility rate of 2.1, the rate required for zero population growth; the detailed forecasts of population growth of course reflect the existing demographic structure. Separate analyses are presented for the "wage indexed benefits" proposal of HEW and the "price indexed benefits" proposal of the Consultant Panel. The same taxable wages are projected for both proposals on the assumption that the maximum taxable wage will increase through time to maintain the current standard that 85 percent of workers earn less than the maximum.

The growth of a Social Security fund and its effect on national savings depend on the rate of return earned by the fund and on the tax policy pursued in achieving the development of the fund. As I indicated above, there is a wide range of alternative possibilities and the three that are examined here should be regarded as illustrative of this wide range. In each of the examples I assume that the real return to society on additional capital accumulation is 12 percent. I also assume that government bonds pay a nominal interest rate of 7 percent and that there is a constant 4 percent rate of inflation. The three examples differ in the rules that determine how much of the 12 percent real national return accrues to the fund and therefore in how much of the 12 percent return is reinvested in additional net capital accumulation.

Consider first what I will refer to as the "Low Return-Reinvestment Rule." This rule has two basic features: (1) the fund gets only the 3 percent real return on government debt and (2) the remainder of the extra national return is used to finance private and public consumption. The second "reinvestment" part of the rule is really a separate assumption and does not follow from the first. In principle, the reinvestment could be greater if some of the remainder were also invested. I shall assume, as a

[31]These forecasts were used by the Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds and by the Consultant Panel in its report.

[32]The actual calculations are based on money wage increases of 6 percent and price level increases of 4 percent.

reasonable but conservative approximation, that reinvestment is limited to the return paid to the fund. It may be helpful to explain how the low return-reinvestment rule might work in practice. This is important primarily as a basis for comparison with other rules.

It begins when a $1 excess of Social Security tax receipts over benefits is received by the Social Security fund and invested in previously outstanding government debt. The $1 that the private investor receives for his government bond is then invested in new private securities and finances an extra $1 of private investment.[33] The national return on this additional investment at 12 percent is equivalent to 12 cents a year. If all extra private investment income is consumed and all extra income tax receipts are used to finance either public consumption or tax cuts that yield equal private consumption, only 3 cents of the 9 cents will be reinvested as required by the "low reinvestment rule." This result will obviously be independent of the division between taxes and net private investor income. For example, if the relevant marginal personal and corporate income tax rates are 30 percent and 48 percent and if half of net corporate profits are retained and escape all further tax, an additional 12 cents of corporate income pays 6.7 cents of additional tax. Transferring the government bond with its 7 percent nominal yield from the private investor to the fund reduces tax revenue by 30 percent of 7 cents or 2.1 cents. Net tax collections therefore rise by 4.6 cents. The private investor now has 12 cents of corporate income before tax or 5.3 cents after tax in place of the 0.9 cent real net income that he previously received on his dollar of government debt. His net income is higher by 4.4 cents.[34] The total net receipts of the tax collector and the investor have therefore increased 9.0 cents and by assumption are used to finance consumption. Only the remaining 3 percent that the fund receives is reinvested by an additional purchase of debt by the fund.

The development of the Social Security fund with the low return and reinvestment rule is given by:

$$(4\text{-}1)\quad F_s = F_{s-1} - B_s + T_s + 0.03[F_{s-1} + 0.5(T_s - B_s)]$$

In words, the value of the fund at the end of period s (F_s) is equal to its value at the end of the previous year (F_{s-1}) minus the benefits paid during the year (B_s) plus the taxes collected during the year (T_s) and the 3 percent "interest" received on the sum of the previous fund and the average surplus accumulated during the year.

[33]The analysis would require little modification if the government invested directly in private bonds or mortgages.

[34]Note that this is an increase in real income as conventionally measured but not necessarily in well-being because the investor now owns an asset with greater perceived riskiness.

This laborious description of the simple "low rule" case should make it easier to understand the "high return-reinvestment rule" case. The basic principle of this rule is that the fund should get the full national return on the extra investment that it generates. This is again combined with the assumption that all incremental private and public funds are used to finance consumption. The result is that the fund earns 12 percent on its investments and all of this represents reinvestment. To achieve this the government matches the real interest earned by the fund in a ratio of 3 to 1 with the matching dollars coming from general revenue. In the previous "low return and reinvestment rule" case, private investors receive an additional 4.4 cents of real income when the fund accumulates $1. If the government taxes this away and adds it to the 4.6 cents of extra revenue that it receives with fixed tax rates, it has the 9 cents of general revenue required for the three-to-one matching ratio. By such a proportional matching method of subsidy, the fund gets the entire 12 percent national return. The fund therefore evolves according to (4-2)

$$(4\text{-}2)\quad F_S = F_{S-1} - B_S + T_S + 0.12[F_{S-1} + 0.5(T_S - B_S)] \ .$$

The low and high rules represent possible extremes. Both are difficult to defend in practice. The high rule is unfair to private investors who voluntarily exchange government bonds for higher yielding but riskier corporate securities and then have all of the "risk premium" taxed away. Similarly, the low rule is unfair to Social Security taxpayers because all of the extra income taxes generated because of the Social Security fund accrue as general tax relief or general public consumption. One compromise suggested by these considerations is to leave private investors with the extra yield that they receive as compensation for substituting private assets for government debt while using all of the automatic extra tax revenue to subsidize the fund interest. This would add 4.4 cents to make the fund's total real yield 7.4 percent. This is only one of several possible ways of compromising between the extreme of the low and high options. The third set of simulations assumes instead a 6 percent real rate of return (half of the national real return on investment) and an equal reinvestment rate.

Each simulation considers the consequences of a particular Social Security payroll tax rate on the development of the Social Security fund and on the annual rates of national saving. Tax receipts (T_S) are the product of the assumed level tax rate (t) and the taxable wage base (W_S) projected by the Social Security actuaries. The benefits are all taken to be the values projected by the Social Security actuaries for the HEW_{II} wage indexing plan (B_S') or the Consultant Panel price indexing plan (B_S''). Although an immediate change to a new permanent and higher rate is less likely than a gradual adjustment over several years, the level tax rate assumption captures the essential feature of the change without requiring an arbitrary specification of the path of adjustment. The use of a single level rate in the simulation also serves to emphasize the notion of a common tax rate imposed on successive generations of taxpayers.

As I noted in section 3, a Social Security fund can be developed to make a permanent contribution to capital accumulation or merely to develop enough capital temporarily to permit the financing of the demographic bulge without a future increase in the tax rate. Table 2 presents results for the second rather modest goal, defined here as accumulating enough reserves so that their depletion by the population bulge still leaves a fund approximately equal to one year's benefits in 2050, the terminal year of the simulation. This is referred to in the title of the table as a "terminal fund for transactions only." Table 2 presents the relevant analysis for the HEW wage indexing proposal and Table 3 for the corresponding price indexing proposal.

A detailed examination of the 6 percent "medium reinvestment and return rule" of Table 2 is interesting in itself and will indicate how this and subsequent tables are to be interpreted. Recall first that with this "wage indexing" proposal the tax rate would have to rise to 19 percent if projected benefits are to be financed on a pay-as-you-go basis. In contrast, the current simulation shows that a level tax rate of 12.7 starting in 1977 is sufficient to finance future benefits if the fund earns a moderate 6 percent real yield. Column 1 shows that the fund in the final simulation year (2050) is 84 percent of benefits in that year. The fund starts at its current value of about half of annual benefits and grows to 3.14 times benefits by 1990 and to 6.15 times benefits in 2020 before being reduced to its terminal value. Column 2 shows that in 2020 the fund is equivalent to 44 percent of the currently projected value of gross national product;[35] the Social Security fund would therefore increase the capital stock by about 15 percent.

The implications for the flow of net national saving are shown in columns 3 and 4. Column 3 compares the annual current surplus of Social Security taxes minus benefits to the projected GNP.[36] In 1990, tax receipts would exceed benefits by 0.4 percent of GNP. Column 4 adds the savings out of the "interest" that the Social Security fund earns to the "current account" surplus of column 3; the total addition to national saving in 1990 is a very significant 1.3 percent.[37] By the year 2020, taxes are substantially less than benefits; the current account deficit is 1.6 percent of GNP (column 3). But the earnings of the fund are so large that the overall contribution to national saving is still positive and nearly 1 percent of GNP. Only in the final decades of the program is the fund being depleted and national saving being depressed; the net dissaving rate is 2.2 percent of GNP in 2050.

[35]The comparison is to the GNP that could be expected without the extra capital provided by the fund itself. The ratio to actual GNP would therefore be somewhat smaller.

[36]See the previous footnote.

[37]The corresponding net saving rate has averaged less than 8 percent during the postwar period.

Table 2

LEVEL TAX RATE WITH TERMINAL FUND FOR TRANSACTIONS ONLY: WAGE INDEXING PLAN

Reinvestment and Return Rule	Tax Rate	Year	Social Security Fund Ratio to Benefits	Social Security Fund Ratio to GNP	Effects on Net Saving Rates* Current Surplus Only	Effects on Net Saving Rates* Total Increase in Savings
			(1)	(2)	(3)	(4)
Low 0.03	14.4	1990	4.49	0.23	1.1	1.8
		2020	6.86	0.49	—0.9	0.5
		2050	0.94	0.08	—1.9	—1.6
Medium 0.06	12.7	1990	3.14	0.16	0.4	1.3
		2020	6.15	0.44	—1.6	0.9
		2050	0.84	0.07	—2.6	—2.2
High 0.12	11.1	1990	1.67	0.09	—0.3	0.6
		2020	4.26	0.30	—2.3	1.1
		2050	1.41	0.11	—3.3	—1.9

*Savings rates are expressed as *percentages* of currently anticipated GNP. Effects on net savings are defined as follows:

Current Surplus: tax receipts minus benefits
Total Increase in Savings: current surplus plus "return" on fund.

Table 3

LEVEL TAX RATE WITH TERMINAL FUND FOR TRANSACTIONS ONLY:

PRICE INDEXING PLAN

Reinvestment and Return Rule	Tax Rate	Year	Social Security Fund Ratio to Benefits (1)	Social Security Fund Ratio to GNP (2)	Effects on Net Saving Rates* Current Surplus Only (3)	Effects on Net Saving Rates* Total Increase in Savings (4)
Low 0.03	10.87	1990	0.91	0.04	0.2	0.3
		2020	3.00	0.15	—0.3	0.2
		2050	1.03	0.50	—0.2	—0.03
Medium 0.06	10.45	1990	0.52	0.02	—0.03	0.1
		2020	2.59	0.13	—0.5	0.3
		2050	1.04	0.05	—0.4	—0.1
High 0.12	10.09	1990	0.26	0.01	—0.2	—0.05
		2020	1.82	0.09	—0.6	0.4
		2050	2.86	0.14	—0.5	1.0

*Savings rates are expressed as *percentages* of currently anticipated GNP. Effects on net savings are defined as follows:

Current Surplus: tax receipts minus benefits
Total Increase
in Savings: current surplus plus "return" on fund.

Note that even with a low yield of only 3 percent it is still possible to finance the next 75 years' benefits with a level tax rate of 14.4 percent. If instead the Social Security fund can capture the entire 12 percent real national yield, the level tax rate need only be 11.1 percent. In any case, the very high tax rates of 18 and 19 percent that would be required with pay-as-you-go financing can be avoided during the next 75 years with a Social Security fund accumulated with a relatively modest level rate of tax.

Table 3 presents a parallel analysis for the price indexing proposal of the Consultant Panel instead of the HEW wage indexing proposal. Because real future benefits rise more slowly with price indexing, the level tax rate required to finance future benefits is smaller. For example, simulations of the "medium reinvestment and return rule" with a 6 percent yield indicate that a level tax rate of only 10.45 percent is sufficient with price indexing while 12.7 percent was required for the wage indexing proposal. The transitional fund is also smaller, less than three times benefits in 2020 in comparison to 6.15 times benefits with the wage indexing plan. It also follows that the contribution to net savings is relatively small.

The simulations of Tables 2 and 3 involve the modest goal of financing the next 75 years' benefits with a level tax rate and ending the period with a fund equal to about one year's benefits. In general, this means that the fund is being depleted rapidly in its terminal year, implying that a tax increase will be required sometime after 2020.[38] Moreoever, the "transactions level" terminal fund makes a rather limited temporary contribution to offsetting the adverse effect of Social Security on capital formation. Tables 4 and 5 analyze the more ambitious proposal to develop a growing Social Security capital fund that, by 2050, will be equal in size to the GNP currently projected for that year.[39] The choice of a "fund equal to GNP" goal is clearly an arbitrary standard for a capital fund but it is both "large enough to matter" without being so large that it would pose serious problems of implementation.[40] A capital fund of this size by the year 2050 would also have the substantial virtue that the tax rate could be maintained at a constant level indefinitely.

[38]For example, the "medium rule" in Table 3 shows dissaving equal to 0.1 percent of GNP in 2050. Since the fund is 5 percent of GNP, the rate of depletion is proceeding slowly. This rate accelerates because as the fund is reduced its own earnings make a smaller contribution to offsetting the current year "tax minus benefits" deficit. In contrast, the "medium rule" simulation in Table 2 shows dissaving of 2.2 percent of GNP in 2050 and a fund of 7 percent of GNP, implying almost immediate exhaustion of the fund after 2050.

[39]This would increase the capital stock by about 30 percent and would therefore raise GNP by about 10 percent above its currently projected value. To avoid circularity in definition, I will compare the fund and saving to the smaller currently projected value. For 2050 this is $7,975 billion at 1975 prices.

[40]Note also that the "Social Security wealth" that provides a potential offset to private wealth accumulation is now more than twice GNP.

Consider first the more costly HEW "wage indexing" proposal analyzed in Table 4. With the "medium reinvestment and return rule," a level tax rate of 13.15 percent is sufficient to yield a fund that is equal to GNP in 2050. Note that benefits in 2050 are substantially greater than the tax receipts; the "current surplus" is actually a deficit equal to 2.4 percent of GNP. But the earnings on the fund are sufficient to cover this deficit and provide an overall surplus equal to 3.3 percent of GNP. The fund therefore grows in year 2050 by 3.3 percent. The figures in column 4 show that a capital fund financed by a level tax rate of 13 percent can make a very substantial contribution to the Nation's net saving rate.

A capital fund equal to GNP in 2050 could be achieved with a lower tax rate under the price indexing plan. Table 5 shows that a rate of 10.90 is sufficient with a 6 percent return and reinvestment (in comparison to the corresponding 13.5 percent with wage indexing). The capital fund is large enough to finance the small gap between benefits and taxes and to provide a surplus for saving equal to 5.4 percent of GNP. Since the fund in 2050 equals GNP, this implies that the fund would be growing at 5.4 percent, faster than the rate of growth of real GNP. Eventually it would be necessary to reduce this rate of fund growth, either by limiting the share of the total return that the fund receives (i.e., changing the matching rule) or by reducing the rate of Social Security tax.

Table 6 considers a particular plan for reducing the rate of Social Security tax. In these simulations, a fund is accumulated by the year 2010 that is large enough to "endow" all future Social Security benefits.[41] More specifically, the Social Security tax is eliminated for all years after 2010 and the benefits are financed with the income of the fund. The fund must be large enough in 2010 so that its income can not only finance benefits but also can provide for reinvestment so that the fund grows enough to permit continued financing of benefits in the future. With a 6 percent medium return and reinvestment rule, such an endowment fund can be achieved with a tax rate of 14.3 percent. The fund is then equal to 1.3 times GNP in 2020 and remains at approximately that relative level even though benefits are equivalent to about 5 percent of GNP.

5. *Summary and Conclusion*

I began this paper by reviewing the adverse effect of Social Security on national saving and the substantial long-run financial problem that the Social Security program now faces. Both problems can be alleviated if a Social Security fund is accumulated by raising the tax rate in the near future to provide more revenue than is needed to pay concurrent benefits. Although the resulting fund would be invested in government bonds, it

[41]The welfare economics of such an endowment fund is discussed in Feldstein (1974b).

Table 4

LEVEL TAX RATE WITH TERMINAL CAPITAL FUND:

WAGE INDEXING PLAN

Reinvestment and Return Rule	Tax Rate	Year	Social Security Fund Ratio to Benefits	Social Security Fund Ratio to GNP	Effects on Net Saving Rates* Current Surplus Only	Effects on Net Saving Rates* Total Increase in Savings
			(1)	(2)	(3)	(4)
Low	16.15	1990	6.6	0.34	1.9	2.8
0.03		2020	12.8	0.91	—0.1	2.5
		2050	12.4	1.00	—1.1	1.8
Medium	13.15	1990	3.8	0.19	0.6	1.7
0.06		2020	9.3	0.66	—1.4	2.4
		2050	12.3	1.00	—2.4	3.3
High	11.12	1990	1.7	0.09	—0.3	0.7
0.12		2020	5.0	0.36	—2.3	1.6
		2050	14.1	1.15	—3.3	9.2

*Savings rates are expressed as *percentages* of currently anticipated GNP. Effects on net savings are defined as follows:

Current Surplus: tax receipts minus benefits
Total Increase
in Savings: current surplus plus "return" on fund.

Table 5

LEVEL TAX RATE WITH TERMINAL CAPITAL FUND:

PRICE INDEXING PLAN

Reinvestment and Return Rule	Tax Rate	Year	Social Security Fund Ratio to Benefits (1)	Social Security Fund Ratio to GNP (2)	Effects on Net Saving Rates* Current Surplus Only (3)	Effects on Net Saving Rates* Total Increase in Savings (4)
Low 0.03	12.70	1990	3.4	0.16	0.9	1.4
		2020	11.8	0.59	0.5	2.2
		2050	20.9	1.02	0.6	3.6
Medium 0.06	10.90	1990	1.3	0.06	0.2	0.5
		2020	7.1	0.35	—0.3	1.7
		2050	20.1	0.98	—0.2	5.4
High 0.12	10.11	1990	0.3	0.01	—0.2	— 0.02
		2020	2.9	0.14	—0.6	1.0
		2050	24.1	1.17	—0.5	12.1

*Savings rates are expressed as *percentages* of currently anticipated GNP. Effects on net savings are defined as follows:

Current Surplus: tax receipts minus benefits
Total Increase
in Savings: current surplus plus "return" on fund.

Table 6

LEVEL TAX RATE WITH ENDOWMENT FUND IN 2010:

PRICE INDEXING PLAN

Reinvestment and Return Rule	Tax Rate	Year	Social Security Fund Ratio to Benefits	Social Security Fund Ratio to GNP	Effects on Net Saving Rates* Current Surplus Only	Effects on Net Saving Rates* Total Increase in Savings
			(1)	(2)	(3)	(4)
Medium	14.30	1990	7.0	0.32	1.6	3.4
0.06		2020	25.3	1.30	—5.0	2.3
		2050	28.2	1.40	—4.9	3.0
High	10.55	1990	1.4	0.07	0.01	0.7
0.12		2020	11.0	0.55	—5.0	1.2
		2050	15.8	0.77	—4.9	3.6

*Savings rates are expressed as *percentages* of currently anticipated GNP. Effects on net savings are defined as follows:

Current Surplus: tax receipts minus benefits
Total Increase
in Savings: current surplus plus "return" on fund.

No simulation is shown for the low reinvestment and return rule because the required tax rate would have to be unreasonably high.

would provide an indirect way of increasing real national capital accumulation. Achieving a reasonable rate of return on the fund itself may require a subsidy to the Social Security fund from general revenue in the form of matching the fund's interest income. The general revenue used to provide such matching funds would actually be extra income tax receipts arising from the real net income on the additional capital accumulation. A Social Security fund that earns such a reasonable rate of return would make it unnecessary to depend on a substantial jump in the future tax rate. This avoids both the distortions that such a high rate could bring and the risk that benefits expectations would instead be frustrated because future taxpayers refuse to raise the tax rates to very much above the level of today.

This paper presented for the first time the results of simulations of alternative Social Security fund developments. Each simulation is characterized by a different level tax rate that achieves a fund with a particular desired terminal goal. In general, relatively modest increases in the tax rate can make important contributions to capital accumulation if the tax rate is raised soon and if a matching-subsidy is used to provide the Social Security fund with a real rate of return of 6 percent or more.

It is important to bear in mind the limitations of the current analysis. The simulations are based on a whole series of assumptions that may be far from correct. There has been no attempt to test the sensitivity of these results to changes in the assumptions. Moreover, there is a range of important policy choices about the future development of Social Security that have not been examined: the appropriate evolution of Social Security benefits relative to preretirement income, the progressivity of the tax structure, the treatment of two-earner families, etc. Each of these issues is important in itself and as a factor influencing both the financial future of Social Security and its impact on capital accumulation. If this paper were concerned with determining the optimal Social Security fund, it would be necessary to consider all of these other policy choices as well. But my aim for the current paper has been much more modest: to stimulate discussion about the desirability of developing a substantial Social Security fund. I hope that the important financial and economic effects of the Social Security funds that would result from even relatively small tax rate increases do indeed arouse the interest of my readers as they have my own.

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Discussion

Joseph A. Pechman*

I shall confine my discussion to the major aim of Martin Feldstein's paper as he puts it: "to stimulate discussion about the desirability of developing a substantial social security trust fund." As always, Feldstein has given us some new and imaginative data to digest, this time a series of arithmetic calculations demonstrating the obvious point that there are constant payroll tax rates that would generate a sizable Social Security trust fund in the years 2,020 - 2,050. But, as he himself admits, the desirability of accumulating such a fund does not hinge on these calculations. It hinges on whether it would be good public policy to increase national saving, and with it the size of the private capital stock, by substantial magnitudes. Moreover, even if the answer to this question is "yes," there is no reason why the saving should be done through the payroll tax for Social Security, other than the possibility that Feldstein believes he can more easily persuade politicians to raise Federal Government saving if the saving is called "Social Security" rather than a "budget surplus." This subterfuge would be innocent if the payroll tax happened to be a good tax and if a build-up of such huge surpluses in the Federal budget were a good idea. But the fact is that the payroll tax is the most regressive tax in the Federal tax system, and it is virtually certain that the huge surpluses contemplated by Feldstein would have serious adverse consequences for the growth and stability of the economy.

I will organize my comments around the following points which are essential to Feldstein's arguments: the evidence on the effect of Social Security on the saving rate; the rate of return on a higher stock of private capital; the use of Social Security as a vehicle for accumulating large governmental surpluses; and the problems of economic management that would be generated by the large surpluses.

1. Feldstein repeats his previous finding, which has been seriously challenged by others, that Social Security has reduced private saving by 50 percent. Munnell has examined similar data and has concluded that, while the "benefit" effect of Social Security reduces private saving, earlier

*Director of Economic Studies, The Brookings Institution. In preparing these remarks, I have benefited from comments by Henry J. Aaron, Alicia Munnell's manuscript, "The Future of Social Security," and the discussion of this manuscript at a Brookings conference held in June 1976. Dr. Munnell's study along with her summary of the conference discussion is being prepared as a Brookings book, which will appear in the spring of 1977.

retirement of workers tends to increase saving. Furthermore, she has examined the survey data for OASDI beneficiaries collected for the past 35 years by the Social Security Administration and has found that today's retirees have saved about the same proportion of their income as those retiring 30 years ago, indicating that so far at least Social Security has not reduced saving a great deal.

In any event, it seems to me that Feldstein's finding cannot be anywhere near the right ball park. If Feldstein is right, the private saving rate before Social Security was adopted should have been much higher than what it appears to have been. In fact, everybody who has looked at the data, has concluded that the private saving rate has exhibited an unusual degree of stability over very long periods of time.[1]

I am persuaded by Alicia Munnell's more moderate conclusion that the retirement effect has more or less offset the effect of Social Security benefits so far. Since the retirement effect has just about run its course (because the tendency toward earlier retirement has slowed down greatly), it may be that the "benefit" effect of Social Security will predominate in the future. But all this is beside the point. The real issues are whether the Nation should save more and, if so, whether surpluses generated by higher payroll taxes are the way to do it.

2. Feldstein continues to urge higher saving on the ground that the rate of return on this saving, if invested in private capital, will be about 12 percent a year. At this rate of return, higher saving through Social Security would be a "good deal" for the worker. Feldstein promises us some new data on the return to private saving, but I should like to caution him that use of data for the return on corporate investment alone is by no means indicative of the yield on all private capital. Corporate capital accounts for less than 50 percent of the private capital stock (the remainder consists of dwelling units and farm and nonfarm capital of the noncorporate sector). The rate of return on the entire private capital stock has averaged substantially less than 12 percent in recent years, even if recession years are omitted.

Furthermore, in emphasizing the 12 percent rate of return, Feldstein ignores the elementary economic point that a large increase in the private capital stock is likely to encounter diminishing returns before too long. The careful estimates by Bosworth and his colleagues suggest that the shortfall of saving below private capital needs in the next several years is likely to be of the order of .5 to 1 percent of the GNP,[2] or 3-5 percent of gross private saving. Even the most pessimistic estimates indicate that the

[1]See, in particular, Edward F. Dennison, "A Note on Private Saving," *Survey of Current Business,* August 1958, pp. 261-267; and Paul David and John Scadding, "Private Saving: Ultrarationality, Aggregation, and Denison's Law," *Journal of Political Economy,* March/April 1974, pp. 225-249. The behavior of private savings cannot be inferred directly from figures on net capital formation, as Feldstein suggests.

[2]Barry Bosworth, James S. Duesenberry, and Andres S. Carron, *Capital Needs in the Seventies* (Washington, D.C.: The Brookings Institution, 1975).

shortfall will not be any higher than 2 or 3 percent of the GNP, or of the order of 10-15 percent of gross private saving. Under the circumstances, it would be unwise to assume that new investment can continue to earn a 12 percent return regardless of how much saving is pushed into the corporate sector.

3. Feldstein acknowledges that "there is no compelling economic logic for assigning this (the saving) responsibility to Social Security," but justifies such action on pragmatic grounds. It seems that we can't fool the people or its elected representatives to support large government surpluses unless they are to be associated with Social Security. Whether or not this political judgment is correct, Feldstein should tell us whether *he* thinks that such increased reliance on payroll taxes is desirable from an economic and social point of view.

Henry Aaron has shown that the poor do not get a good deal out of Social Security as the benefit formula suggests, because their life expectancy is lower than average, they enter the labor force earlier than average, their earnings peak is earlier in the life cycle, and their discount rate is much higher than average.[3] Others have explored possibilities for making the payroll tax progressive, or for using general revenues to finance the Social Security System. Feldstein is careful to say that the progressivity of the tax structure is an important policy issue that needs to be examined in connection with the future development of Social Security, but I find no evidence in anything he has written on this subject — and it is a great deal — that the regressivity of the payroll tax worries him. An across-the-board increase in individual income tax rates of about 1.1 percentage points would raise as much revenue as a percentage point of the payroll tax. I am puzzled that Feldstein refers to the payroll tax as a method of financing when this progressive alternative is available.

4. Feldstein is most cavalier in his assumption that a vast increase in the supply of saving can easily be absorbed without unhappy economic repercussions. He dismisses that possibility by assuming that the demand-depressing effect of the higher saving can be offset by a reduction in the rate of interest. I am not so certain, and I doubt that he can persuade many economists, let alone the public and its political leaders.

The record since the end of World War II is by no means reassuring. The economy operated at or near full employment for only brief periods when the Nation was not at war (I can recollect 1947-48, 1955-57, 1965 and 1973). The rest of the time there was a shortage of demand, not a shortage of saving; in present and immediately foreseeable circumstances, we are having the same problem. A precipitate increase in the full employment budget surplus is likely to plunge the Nation into a real depression.

[3]Henry J. Aaron, "Demographic Effects on the Equity of Social Security Benefits," *The Economics of Public Service*, edited by M.S. Feldstein and R.P. Inman (Halsted, 1976); and Statement by John A. Brittain, *Financing the Social Security System*, Hearings before the House Committee on Ways and Means, May-June, 1975, p. 136.

Consequently, we need a detailed explanation of how the transition to higher saving can be managed, a subject that Feldstein also has ignored. He would be a lot more persuasive if he dealt with the questions of full employment and distribution of tax burdens with the same diligence he devotes to the inefficiencies generated by an allegedly inadequate capital stock starving for lack of saving in an economy that is, more often than not, plagued by oversaving.

Response to Pechman

Martin Feldstein*

I am sorry that Joe Pechman decided not to comment on the central focus of my paper. The current conference was organized to discuss how the funding of private and public pensions will affect national capital accumulation and the financial markets. I presented detailed estimates of the additional national savings that would result from alternative Social Security tax rates and reinvestment rules. Unfortunately, Pechman has chosen to ignore all of this. Instead, he uses this occasion to reiterate his aversion to the Social Security payroll tax and to restate his pessimistic and totally unsupported position that the United States cannot significantly increase its rate of capital accumulation.

When I began studying the capital accumulation effects of Social Security, I thought that the development of a Social Security fund was economically desirable but politically unlikely. I have come to believe the opposite, that we will in fact have a sizable Social Security fund but for political rather than economic reasons. The long-run financial problems of the Social Security program and the public's desire to protect its Social Security benefits will combine to provide political support for a Social Security fund. With the current pressures to change the financing of Social Security, it is important to consider the likely effects that different Social Security funding arrangements would have on the flow of funds into financial markets. I hope that other readers will regard this prospect more openly and seriously than Pechman has.

It would take too long to reply adequately to the points that Pechman does raise. I will comment primarily on the issue of the effect of Social Security on national saving and more briefly on four other points.

Pechman disagrees with the finding of my previous research that Social Security depresses private saving but he does not comment on any of the evidence that has been presented (studies of U.S. aggregate data since 1929, international comparisons of savings rates, and the analysis of household survey data). Instead he refers to a conclusion that he attributes to Munnell that the retirement effect has, in his words, "more or less offset the effect of Social Security benefits." In fact, Munnell summarizes her own most recent scientific research with the final sentence, "These results indicate that Social Security does have a significant negative impact on saving which confirms the findings of two earlier studies of aggregate saving and Social Security by Munnell and Feldstein."[1]

*Because the program provided little time for rebuttals, Professor Feldstein spoke only briefly. After the conclusion of the conference, he therefore rewrote and expanded his comments, which are published here.

Pechman mistakes my estimate of the likely magnitude of the savings reduction and then disputes it with two fallacious arguments. The evidence in my 1974 paper implied that Social Security halved *personal* saving and therefore reduced *private* saving by 38 percent, not the 50 percent referred to by Pechman. Pechman reasons that Social Security cannot have depressed the private saving rate because, as he sees it, that rate has not declined since the time before Social Security began. The inference would be false even if the premise were correct. What matters is not the comparison of the current saving rate with its historical value but with the rate that would have prevailed today in the absence of Social Security. The greater affluence of the American people and the much greater fraction which retires by age 65 would, without Social Security, have produced a much higher saving rate than has actually prevailed.

Moreover, the premise is false. It is not true that "everybody who has looked at the data has concluded that the private saving rate has exhibited an unusual degree of stability over very long periods of time." As I pointed out in section 1, Simon Kuznets, who received the Nobel prize in part for his studies of the long-run trends in capital accumulation, reported a substantial decline in the net rate of capital accumulation. The net national capital formation rate fell from 11.9 percent in 1868-1928 to 7.7 percent in the postwar period; since the government deficit in the postwar period only reduced the national saving rate by less than 1 percentage point, the private saving rate has clearly fallen substantially.[2]

Finally, it is incorrect to reason as Pechman does that all of the positive impact on saving of earlier retirement should be regarded as an effect of Social Security. Much of the increased retirement in the past 50 years would no doubt have occurred simply because of higher incomes, urbanization, decline of self-employment, the depression, etc.; a simple extrapolation of the geometric rate of decline in labor force participation from 1900 to 1929 can account for nearly 75 percent of the increase in retirement since 1929.

In short, there is nothing in Pechman's comment that would make me reconsider the implication of my econometric research that Social Security has a substantial depressing effect on the private saving rate. Let me conclude my reply to Pechman with four very brief remarks on other issues that he has raised:

[1]A. Munnell, "Private Pensions and Saving: New Evidence," *Journal of Political Economy*, October 1976, p. 1031.

[2]Pechman tries to dismiss this evidence by commenting that the behavior of private savings cannot be inferred directly from figures on net capital formation. Since private saving minus the government deficit equals capital formation, it is easy enough to make the correct comparison. All of this is explained in my "National Saving in the United States" (Feldstein, 1977c) referred to in the paper.

(1) I am certainly aware that a large increase in the private capital stock would reduce the national return on capital. But the widely accepted approximation of a Cobb-Douglas technology implies that increasing the national capital stock by 20 percent (approximately $1 trillion dollars) would only reduce the rate of return from 12 percent to 10.6 percent.

(2) Pechman's statement that "careful estimates by Bosworth and his colleagues suggest that the shortfall of saving below private capital *needs* is likely to be of the order of one-half to one percent of GNP..." is meaningless. What are those "capital *needs*?" The economy can benefit from greater capital accumulation just as it can survive with less.

(3) Although Pechman does not like the payroll tax, it still has a very wide political support and is likely to remain the source of finance for Social Security. The issue of whether or not to accumulate a fund is, in this regard, a question of when the payroll tax should be paid and the extent to which earlier payments can reduce substantially the tax revenues required later. As I have argued elsewhere,[3] the progressivity of the Social Security tax should not be regarded as a separate issue but as part of the overall progressivity of the tax system. In setting income tax rates (including the refundable earned income credit), Congress can and presumably does offset any undesired lack of progressivity in the payroll tax.

(4) I am amazed that Pechman concludes his comments with the old-fashioned Keynesian warning that our economy is "plagued by oversaving." I cannot understand why Pechman believes that the U.S. saving rate must remain lower than the rate in almost every other industrial nation. While I have not presented a detailed simulation of the monetary and tax policies that would be needed to accommodate a higher rate of capital accumulation, I have no doubt that such accommodation is possible. Whatever the problems were in the 1930s, there should be no difficulty now in reducing the relative cost of capital to firms by enough to induce them to absorb an extra few percent of GNP in additional capital accumulation.[4]

[3]See Feldstein (1975 and 1976f). These are based on testimony to the Ways and Means Committee (May 1975) and the Joint Economic Committee (May 1976).

[4]When this question was discussed at the conference, none of the economists disputed this conclusion.

Funding Government Pensions: State-Local, Civil Service and Military

Alicia H. Munnell and Ann M. Connolly*

The fiscal operations of government pension plans affect the growth of the economy as well as the welfare of its citizens. Economic theory implies and recent empirical evidence indicates that individuals reduce their private saving in anticipation of pension benefits.[1] The net impact on national saving, however, depends on whether the reduction in private saving is offset by pension fund asset accumulation. In the case of private pensions, the funding provisions serve to offset any reduction in individual saving.[2] In contrast, Social Security is financed on a pay-as-you-go basis and contributions are immediately paid out in benefits rather than accumulated in a fund; therefore a reduction in individual private saving

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[1]See Martin Feldstein, "Social Security, Induced Retirement and Aggregate Capital Accumulation," *Journal of Political Economy,* Vol. 82, No. 5 (September/October 1974) and "Social Security and Saving: The Extended Life Cycle Theory," *American Economic Review,* Vol. 66, No. 2 (May 1976) pp. 77-86; Alicia H. Munnell, *The Effect of Social Security on Personal Saving* (Ballinger Publishing Company, 1974) and "Private Pensions and Saving: New Evidence," *Journal of Political Economy,* Vol. 84, No. 5 (September/October 1976).

[2]Munnell, "Private Pensions and Saving: New Evidence," *Journal of Political Economy.*

implies a reduction in total national capital accumulation.[3] Similarly, other large government pensions such as civil service, military or state-local retirement systems which are financed either on a pay-as-you-go or only a partially funded basis will also, to the extent that they are underfunded, reduce national saving. This paper attempts to estimate the degree to which these other public pension systems are underfunded and to calculate the impact on national saving and capital accumulation of financing these programs on a fully funded basis.

In order to determine the impact of funding, 25-year forecasts of the financial operations of the state-local, civil service and military retirement systems are provided under two alternative sets of assumptions. The first estimates are based on extrapolations of current trends in benefit growth and contributions, while the second projections are based on the assumption that the state-local, civil service and military pension systems all attempt to cover normal costs and to amortize their unfunded liabilities over the next 40 years.

To derive a funding schedule it was necessary to calculate an unfunded liability for civil service, military and aggregate state-local systems and to calculate the normal cost for each program. Three different methods were employed in this gargantuan undertaking and the results for civil service and the military were compared with agency published estimates. Naturally, the least verifiable calculation was the estimate of aggregate state-local liability since almost no comparable data are available in this area.

These unfunded liabilities were then amortized over a 40-year period and this payment together with the normal cost payment yielded the required annual contribution for a fully funded system. These payments were then compared with projections made under the current financing scheme to determine the impact on fiscal flows of shifting to full funding.

The empirical results were interesting, although there is always the danger that they may be interpreted with more precision than deserved. The estimates of unfunded liability for the three systems amounted to $629 billion — approximately $270 billion for state-local; $164 billion for

[3]Feldstein, "Social Security, Induced Retirement and Aggregate Capital Accumulation" and Munnell, *The Effect of Social Security on Personal Saving.* Although both of these studies point overwhelmingly to the conclusion that guaranteed retirement benefits discourage saving, the net impact of the Social Security program on capital accumulation remains unclear because of the existence of the "retirement effect." The Munnell study indicates that the negative effect of guaranteed benefits has been mostly offset in the past by a declining retirement age which compelled workers to save over a shorter working life for a longer retirement. Estimates of the net impact of Social Security now range from near zero (Munnell 1974) with the benefit and retirement effects virtually offsetting one another, to a halving of the individual saving rate with individuals reducing their saving by more than their OASDI taxes (Feldstein, 1974).

civil service and $195 billion for the military.[4] Amortizing these liabilities over 40 years and covering normal costs would require significantly higher contributions, almost all of which would serve to reduce consumption and increase saving. Comparing the contributions required for funding with those required under the current financial arrangements indicates additional annual contributions amounting to about 1.2 percent of GNP or 1.6 percent of disposable income. If the assumptions underlying the baseline projections are realistic, the additional contributions to fund these public pension systems would result in a significant increase in asset accumulation over the next 25 years.

I. The Growth of Government Pensions

Public pensions have experienced explosive growth in the last 15 years. This growth reflects the enormous increase in government employment, rising government salaries and the emergence at the state-local level of strong public employee unions. In 1975, 14.7 million individuals worked for Federal, state or local governments accounting for 19 percent of total wage and salary workers. In addition, another 2.2 million individuals were members of the armed forces. (See Table 1.) Today, approximately 14 million workers are covered by state-local, military or civil service retirement plans, compared to 80 million covered by Social Security or 30 million covered by private pensions. (See Table 2.)

In 1975, state-local systems, Federal civil service and the military each dispensed about $7 billion, or a total of $21 billion, in benefits to approximately four million beneficiaries. (See Table 3.) These figures compare to $67 billion in benefits and 32 million beneficiaries under OASDI in 1975[5] and $13 billion and 6 million beneficiaries from private pension plans in 1974.[6]

The increase in benefits and beneficiaries is summarized in Table 4. Total benefit payments for each system have increased at least seven-fold between 1960 and 1975, while the number of beneficiaries for state-local and civil service pensions increased two and a half times and the number of military beneficiaries was four times the 1960 level.

Table 5, which presents the growth in asset holdings of various pension plans, provides considerable information about the financing and funding of the three public plans. First, the military pension involves no

[4]These estimates are based on a 6 percent interest rate and 5 percent wage growth; a higher rate of interest would yield lower figures and a lower rate higher values.

[5]U.S. Department of Health, Education, and Welfare, Social Security Administration, *Social Security Bulletin,* Vol. 39, No. 6 (June 1976) Tables M-1 and M-3, p. 32 and p. 34.

[6]Alfred M. Skolnik, "Private Pension Plans, 1950-74," *Social Security Bulletin,* Vol. 39, No. 6 (June 1976), p. 4.

Table 1

MILITARY AND WAGE AND SALARY WORKERS IN NONAGRICULTURAL ESTABLISHMENTS
1940-1975, SELECTED YEARS

	Military	Private			Government			
	(millions)	Total (millions)	Workers (millions)	Percent of Total	Workers (millions)	Percent of Total	Workers (millions)	Percent of Total
1975	2.2	77.0	62.3	80.9	2.7	3.5	12.0	15.6
1970	3.2	70.9	58.4	82.4	2.7	3.8	9.8	13.8
1965	2.7	60.8	50.7	83.4	2.4	3.9	7.7	12.7
1960	2.5	54.2	45.8	84.5	2.3	4.2	6.1	11.3
1955	3.0	50.7	43.8	86.4	2.2	4.3	4.7	9.3
1950	1.6	45.2	39.2	86.7	1.9	4.2	4.1	9.1
1945	11.4	40.4	34.5	85.4	2.8	6.9	3.1	7.7
1940	.5	32.4	28.2	87.0	1.0	3.1	3.2	9.9

Source: *Economic Report of the President,* 1976, Table B-27, p. 202 and Table B-22, p. 196.

Table 2

NUMBER OF WORKERS COVERED UNDER PUBLIC AND PRIVATE PENSION PLANS, 1975

System	Number of Workers (millions)
Private Pension Plans	30.0[a]
Public Pensions	
OASDI	79.7
State-Local	9.0[a]
Civil Service	2.7[b]
Military	2.2[b]

[a]Data for 1974
[b]1975 Employment

Source: Alfred M. Skolnik, "Private Pension Plans, 1950-1974," *Social Security Bulletin,* Vol. 39, No. 6 (June 1976) p. 4; *Economic Report of the President,* 1976, Table B-27, p. 202 and Table B-22, p. 196; U.S. Department of Health, Education and Welfare, Social Security Administration, Office of the Actuary; Institute of Life Insurance, *Pension Facts 1975,* pp. 32-33.

Table 3

BENEFITS AND BENEFICIARIES
UNDER PUBLIC EMPLOYEE RETIREMENT SYSTEMS
CALENDAR YEAR 1975

Retirement System	Total Benefit Payments (millions)	Beneficiaries as of June 30 (thousands)
State and Local Systems	$7,000.0	1,730.0
Federal Contributory Systems	7,615.9	1,381.2
Federal Civil Service	7,531.5	1,372.1
Foreign Service	62.4	4.2
Tennessee Valley Authority	18.6	4.4
Federal Reserve Board	2.3	.3
Federal Judiciary Survivors	1.1	.2
Federal Noncontributory Systems	6,979.3	1,098.5
Military	6,808.0	1,073.0
Coast Guard	115.2	16.5
Federal Reserve Banks	23.3	6.7
Public Health Service	22.7	1.5
Federal Judiciary	7.2	.2
Environmental Science Services	2.1	.1
Canal Zone Construction	.3	.4
Tax Court	.4	*

*Less than 500,000.

Source: U.S. Social Security Administration, Research and Statistics Note No. 16, August 20, 1976.

Table 4

BENEFITS AND BENEFICIARIES OF PUBLIC PENSION PLANS, 1940-1975 SELECTED YEARS

	State-Local		Civil Service		Military[a]	
	Benefits (millions)	Beneficiaries (thousands)	Benefits (millions)	Beneficiaries (thousands)	Benefits (millions)	Beneficiaries (thousands)
1975	$7,000	1,730	$7,531	1,372	$6,810	1,073
1970	3,280	1,291	2,819	959	3,133	773
1965	1,775	886	1,385	728	1,505	485
1960	1,021	660	816	575	751	264
1955	595	427	379	296	471	187
1950	320	294	192	172	290	125
1945	173	208	94	86	74	37
1940	125	152	68	63	52	32

[a]Data for military were estimated on the basis of the 1974 and 1975 ratio of military to "other Federal employees."

Source: U.S. Department of Health, Education and Welfare, Social Security Administration, *Social Security Bulletin,* Annual Statistical Supplement, 1974 and Research and Statistics Note No. 17, (August 20, 1976).

Table 5

ASSET HOLDINGS OF PRIVATE AND PUBLIC PENSION FUNDS
BOOK VALUE, END OF YEAR, 1940-1975
(billions of dollars)

	1940	1945	1950	1955	1960	1965	1970	1975
Private Pensions	$2.0	$5.4	$12.1	$27.5	$52.0	$86.5	$138.2	$214.6
Insured	0.6	2.6	5.6	11.3	18.8	27.3	41.2	69.4
Noninsured	1.4	2.8	6.5	16.1	33.1	59.2	97.0	145.2
Public Pensions								
OASDI	2.0	7.1	13.7	21.7	22.6	19.8	41.3	55.0
State-Local	1.6	2.5	5.3	10.5	19.3	33.1	58.1	106.5
Federal Civilian	0.6	2.3	4.2	6.6	10.6	15.9	23.1	38.6
Railroad Retirement	0.1	0.7	2.6	3.5	3.7	3.9	4.4	3.0
Military	—	—	—	—	—	—	—	—

Source: Figures taken from annual surveys by the Securities and Exchange Commission published in the SEC's *Statistical Bulletin*, Vol. 35, No. 4, April 1976. p. 212. OASDHI data from *1976 Annual Report of the Board of Trustees and the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds*, Tables 16 and 20 pp. 58 and 62 and *1976 Annual Report of the Board of Trustees of the Federal Hospital Insurance Trust Fund.*

asset accumulation and is funded entirely on a pay-as-you-go basis. Second, while the state and local systems and the civil service may be substantially underfunded, the assets held by these two systems total over $145 billion — approximately two-thirds the total assets held by all private pension plans. Furthermore, the assets of these two plans are more than double those held in the Social Security Trust Fund. In view of their size, these often neglected government pension plans could have a significant impact on capital markets — especially if the funding targets were increased. The next sections will present a brief summary of the major features of each of the three public pensions. Then estimates will be developed of the impact of moving to fully funded systems.

State-Local Pension Plans

State and local pensions have grown rapidly in the last 15 years. This growth reflects the enormous increase in state and local employment and the influence of strong public employee unions. Over the period 1960-1975, membership in state-local pension plans increased from four and a half million to over nine million and the proportion of full-time employees covered by such plans now stands at 97 percent. (See Table 6.)

As of the last (1972) Census of Governments there were over 2,300 independent state-local pension plans of varying size, each with its own eligibility, vesting, financing and benefit provisions. (See Table 7.) While the characteristics of these plans are diverse and complex, it is possible to describe features of what might be considered a "typical" plan. Robert Tilove, in a recent study of state-local retirement systems, surveyed a large number of plans and summarized the following characteristics for such a plan.[7]

Benefit formula. Each employee's annual pension is calculated on the basis of 1.67 percent of his final salary for each year of employment. Therefore, after 30 years of service, the benefit would be equivalent to 50 percent of final salary. Final salary is defined as the average of the five highest paid years in the last ten years of service.

Postretirement adjustment. Pension benefits are increased annually, up to 3 percent, in line with changes in the consumer price index.

Retirement age. Employees may retire with full benefits at age 60 with ten years of service and actuarially reduced benefits are available at age 55. Retirement is compulsory at age 70.

Vesting. If an employee leaves after ten years of service and does not withdraw his contributions, he is entitled to benefits at the appropriate age.

[7]Robert Tilove, *Public Employee Pension Funds,* A Twentieth Century Fund Report (Columbia University Press, 1976), pp. 9-11.

Table 6

NUMBER AND PERCENTAGE OF STATE AND LOCAL EMPLOYEES COVERED BY RETIREMENT SYSTEMS, 1950-1974, SELECTED FISCAL YEARS

	Membership in Retirement Systems		Total Employees		Full-Time Employees	
	Total	Current Contributors	Number	Percent in Retirement System	Number	Percent in Retirement System
	(millions)		(millions)		(millions)	
1974	10.4	8.9	11.8	75.4	9.2	96.7
1970	8.4	7.2	10.1	71.3	8.0	90.0
1965	6.6	5.7	8.0	71.3	6.6	86.4
1960	5.1	4.4	6.1	72.1	5.3	83.0
1955	3.8	3.4	5.1	66.7	4.3	79.1
1950	2.8	2.5	4.3	58.1	3.5	71.4

Source: U.S. Department of Commerce, Bureau of the Census, *Public Employment in 1975,* CE No. 1 (1976) and earlier issues. Institute of Life Insurance, *Pension Facts 1975,* Table 32, pp. 32-33.

Table 7

NUMBER AND MEMBERSHIP OF STATE AND LOCAL PENSION SYSTEMS, BY SIZE OF SYSTEM
FISCAL YEARS 1957, 1967, 1972

Size of System	1972 Number of Systems	1972 Total Membership (thousands)	1967 Number of Systems	1967 Total Membership (thousands)	1957 Number of Systems	1957 Total Membership (thousands)
10,000 or more	110	8,205	104	6,009	83	3,359
5,000 — 9,999	47	328	36	237	28	194
1,000 — 4,999	153	336	148	333	124	271
500 — 999	126	87	113	80	100	70
100 — 499	431	94	407	93	374	85
Less than 100	1,437	39	1,357	39	1,496	41
All Systems	2,304	9,089	2,165	7,068	2,205	4,021
			Cumulative Percent of Total			
10,000 or more	4	90	5	89	4	84
5,000 or more	6	94	6	92	5	88
1,000 or more	13	97	13	97	11	95
500 or more	18	98	18	98	15	97
100 or more	37	99	37	99	32	99
Less than 100	100	100	100	100	100	

Source: U.S. Department of Commerce, Bureau of the Census: *Census of Governments 1957, 1967, 1972.* "Employee Retirement Systems of State and Local Governments," Vol. 6, No. 1, Table 4.

Disability. Disability benefits of not less than 25 percent of final average salary are provided to workers with ten years of service. The service requirement is waived if the disability is job-connected.

Survivor's benefit. A retiring employee can elect a reduced benefit for himself in exchange for a survivor's benefit for his spouse.

Employee contributions. The employee contributes 5 percent of his pay; if he terminates employment, he can get a refund with interest.

Social Security. The employee is covered by Social Security and his state-local benefit is not reduced to account for Social Security coverage.

In short, the typical employee of state or local government after 30 years of service can retire at age 60 on a pension of 50 percent (and sometimes higher) of his average pay for the last five years. In addition, the employee can draw full Social Security benefits at age 65, which increases his pension income to about 80 percent of his final salary.

Table 8 presents the benefits, receipts and financial assets for all state-local government retirement systems from 1952-1975. Table 9, which allocates receipts by source of income, reveals that government contributions have consistently amounted to slightly less than one-half of revenues, while the employees' contribution has been declining as earnings on investment have increased in importance. As of 1975, assets of state-local retirement systems stood at almost $100 billion. Table 10 presents the breakdown of the state-local reserves by type of asset for 1966 and 1975. This breakdown indicates a significant shift away from U.S. Government securities into common and preferred stocks during the last ten years.

Civil Service Retirement Fund

Virtually all civilian Federal workers are covered under the Civil Service Retirement System, which was established in 1920. As of 1975, the Civil Service System numbered 2.7 million contributors and paid out $7 billion in benefits. The system is financed by contributions from employees and the employing agency combined with an appropriation from general revenues. The following sections will summarize the main features of the system's benefits, financing and reserve position.[8]

Benefits. The Civil Service Retirement System provides retirement, disability and survivors' pensions and also lump-sum refunds for those separating from service. Full retirement benefits are payable under several combinations of age and service, namely, age 55 with 30 years of service, age 60 with 20 years (10 years for members of Congress), and age 62 with 15 years. Full disability benefits are payable after five years service and the definition of disability is considerably more liberal than that under Social Security since benefits are awarded if the individual is incapacitated

[8]For a more detailed description of the Civil Service Retirement System see Robert J. Myers, *Social Security* (Richard D. Irwin, 1975), pp. 572-80.

Table 8

BENEFITS, RECEIPTS AND ASSETS OF STATE AND LOCAL GOVERNMENT RETIREMENT SYSTEMS, FISCAL YEARS 1952-1975
(millions of dollars)

Years	Benefits	Receipts Contributions Total	Government	Employee	Earnings on Investment	Assets
1952	$ 530	$ 922	$ 387	$ 350	$ 185	$ 6,406
1953	585	N.A.	N.A.	N.A.	194	7,402
1954	679	N.A.	N.A.	N.A.	229	8,709
1955	722	N.A.	N.A.	N.A.	267	9,902
1956	825	N.A.	N.A.	N.A.	307	11,305
1957	941	2,455	1,200	899	357	12,834
1958	1,073	N.A.	N.A.	N.A.	417	14,555
1959	1,145	2,974	1,403	1,073	498	16,340
1960	1,265	3,393	1,652	1,140	601	18,539
1961	1,383	3,724	1,806	1,201	717	20,875
1962	1,567	3,997	1,883	1,288	827	23,294
1963	1,690	4,394	2,100	1,361	933	25,629
1964	1,844	4,787	2,256	1,466	1,065	28,639
1965	2,008	5,260	2,418	1,626	1,216	31,814
1966	2,219	5,771	2,630	1,771	1,370	35,262
1967	2,609	6,580	3,055	1,960	1,565	39,265
1968	2,824	7,568	3,585	2,193	1,791	43,652
1969	3,202	8,558	3,976	2,440	2,142	48,873
1970	3,638	9,848	4,600	2,788	2,460	54,918
1971	4,155	11,310	5,241	3,159	2,910	61,603
1972	4,768	12,620	5,750	3,100	3,471	68,760
1973	5,812	14,878	6,649	4,166	4,064	78,417
1974	6,639	16,527	7,821	4,207	4,500	87,488
1975	7,490	18,898	9,116	4,488	5,294	98,064

Sources: U.S. Bureau of the Census: *Finances of Employee-Retirement Systems of State and Local Governments,* 1960, 1961, 1963-64, 1964-65, 1965-66, 1967-68, 1968-69, 1970-71, 1972-73, 1973-74, Table 2 and in 1960, p. 3; John P. Mackin, *Protecting Purchasing Power in Retirement,* (New York: Fleet Academic Editions, Inc., 1971) Table II-3, p. 14; Robert Tilove, *Public Employee Pension Funds,* (New York: Columbia University Press, 1976) Table 8.2, pp. 170-171.

Table 9

STATE AND LOCAL PENSION SYSTEM RECEIPTS BY SOURCE 1952-1975, SELECTED FISCAL YEARS
(millions of dollars)

Year	Total	Employee Contribution	Government Contribution	Earnings on Investment
1975	$18,898	$4,488	$9,116	$5,294
1970	9,848	2,788	4,600	2,460
1965	5,260	1,626	2,418	1,216
1960	3,393	1,140	1,652	601
1957	2,455	899	1,200	357
1952	922	350	387	185
		Receipts as a Percent of Total		
1975		23.7	48.2	28.0
1970		28.3	46.7	25.0
1965		30.9	46.0	23.1
1960		33.6	48.7	17.7
1957		36.6	48.9	14.5
1952		38.0	42.0	20.1

Source: U.S. Department of Commerce, Bureau of the Census: *Finances of Employee Retirement Systems of State and Local Governments* 1960 p. 3, 1964-5, 1969-70, 1974-5, Table 2; Robert Tilove: *Public Employee Pension Funds* (New York: Columbia University Press, 1976) Table 8.2, pp. 170-71.

Table 10

ASSETS OF STATE AND LOCAL GOVERNMENT RETIREMENT PLANS, 1966 and 1975
(Book Value, End of Year)

	Percent of Total Assets	
	1966	1975
Cash and Deposits	1.1	.6
U.S. Government Securities	21.4	6.5
State & Local Government Securities	6.8	1.8
Corporate and Other Bonds	51.1	61.2
Common and Preferred Stocks	5.7	23.2
Mortgages	12.2	6.9
Other	1.9	—
Total Assets	100.0[a]	100.0[a]

[a]Totals may not add due to rounding.

Source: Securities and Exchange Commission, *Statistical Bulletin,* Vol. 35 No. 4 (April 1976); Louis M. Kohlmeier, *Conflicts of Interests: State and Local Pension Fund Asset Management.* (Twentieth Century Fund, 1976), Table 3, p. 28.

from performing the duties for his usual occupation rather than unable to engage in any reasonable gainful employment. Child survivors of employees are also entitled to benefits and a retiree can provide for his other dependent survivors by accepting a reduced annuity.

The amount of the basic employee pension is based on the number of years service and the average salary during the highest three consecutive years. The benefit formula is 1 1/2 percent per year for the first five years, 1 3/4 percent per year for the next five years, and 2 percent per year thereafter up to a maximum pension of 80 percent (attained after 42 years of service). Automatic cost-of-living adjustments are made whenever the CPI increases more than 3.0 percent monthly for three consecutive months. Until recently, benefits were increased by the amount of the CPI increase plus 1 "bonus" percentage point. This additional 1 percent was originally defended as compensation for the lag in the adjustment process. However, such an offset would be required only on a one-time basis for each employee rather than each time benefits were increased. When it was recognized that this provision overcompensated beneficiaries for cost-of-living increases, the procedure was then justified on the grounds that beneficiaries should share in the increased productivity after retirement. Finally, the additional 1 percent was eliminated in September 1976.[9]

Disability pensions are calculated in the same manner as retirement pensions, except that a special minimum of 40 percent of the high year average salary is provided for those with short service (but with at least the five years required for eligibility purposes). The minimum provisions are applicable for disability cases with less than 22 years of service.

Pensions are available for widows and widowers if the employee elects a reduced benefit. The survivor benefit is equal to 55 percent of the full pension for which the retired member was eligible (i.e., before the reduction to take account of the survivor protection). Actually the reduction required is minimal compared to the true actuarial cost of purchasing such additional protection.[10] The first $300 of monthly pension is reduced by only 2 1/2 percent and all pension above this amount is reduced by 10 percent — this compares favorably with the true actuarial cost which probably averages 15 percent.

Financing. Each employee contributes 7 percent of his total compensation and each employing agency makes a matching contribution to the Civil Service Retirement Fund. In 1971, the general Treasury began to

[9]When the 1 percent "bonus" was eliminated, the timing of cost-of-living increases was also changed. In the future benefits will be adjusted in March by the percentage increase in the CPI occurring between June and December of the prior year and again in October based on the CPI movement between December of the prior year and June of the current year.

[10]Myers, *Social Security*, p. 575.

make additional payments to meet the remainder of the overall cost of the program. As a result of the 1971 reforms, the Treasury began to transfer amounts equivalent to an increasing proportion of the interest on the unfunded liability (10 percent in fiscal 1971, 20 percent in 1972, etc.) and by 1980 will be paying all of the interest on the accrued unfunded liability. In addition, the Treasury also makes annual payments to amortize in level instalments over a 30-year period any increase in the unfunded liability resulting from any statute enacted after October 20, 1969 which authorizes new or liberalized benefits, extension of coverage or increase in salaries on which benefits are based.

In fiscal 1975, total contributions to the Civil Service Fund amounted to $9.2 billion or 26 percent of payrolls. (See Table 11.) By 1980, after the phase-in of the interest payment on the unfunded liability is completed, costs as a percent of payroll will amount to almost 33 percent. Table 12 summarizes the benefits, revenues and assets for the Civil Service Retirement Fund for the last 25 years. As of 1975, the Fund held assets of $38 billion.

Military

Members of the military services are covered by a noncontributory pension plan, which is operated on a completely pay-as-you-go basis. Pension benefits are awarded after 20 years of service regardless of age (with the readily obtainable consent of Congress) or unilaterally with 30 years of service. Retirement before 20 years of service is possible only in cases of disability. The retirement benefit is calculated on the basis of 2 1/2 percent of final basic pay for each year of service up to a maximum of 75 percent. However, since basic pay excludes allowances for subsistence and housing as well as special pay, a person retiring with 30 years of service at a benefit rate of 75 percent receives a pension equivalent to about 50 percent of his previous total compensation.

Survivors' benefits of 55 percent of retired pay are provided on an elective basis as under civil service. However, unlike civil service, survivors' benefits are integrated with Social Security. The military service benefit is reduced by the portion of the spouse's OASDI benefit which is attributable solely to military coverage under OASDI.

Benefits are automatically adjusted for changes in the cost-of-living. As for civil service, the additional 1 percent "bonus" for military beneficiaries was eliminated in September 1976.

Benefit payments under the military retirement system are summarized in Table 4. Since the program is financed on a pay-as-you-go basis, there is no interest income or asset accumulation.

Summary

The main characteristics of the three major pension plans are summarized in Table 13. For state-local and civil service, retirement is around age 60, while the military requires only 20 years of service which lowers

the retirement age to the early forties. The calculation of benefits in all three cases is quite similar: a designated percent for each year of service applied to (more or less) final salary. However, the cost-of-living adjustment under the military and civil service is more generous than the typical state-local plan where cost-of-living increases are generally limited to 3 percent.

The financing of the three systems varies significantly. State-local systems are generally contributory with the employee paying approximately 5 percent and civil service requires a contribution of 7 percent. This contrasts sharply with the financing of the Military Retirement Plan which is noncontributory. Furthermore, the military is financed on a pay-as-you-go basis and has no assets, while both state-local and civil service make some contribution towards funding their system.

The next section will establish baseline projections for benefits, revenues and asset accumulation for each system on the assumption that they maintain their current financial arrangements. The following section will develop flows based on the assumption that the system moves to full funding.

II. Baseline Projections

Forecasts of the performance of state-local, civil service and military pension plans were made for the year 2000. These estimates were based on the extrapolation of trends and on the assumption of no change in funding policy. Contributions and benefits were estimated independently, while interest income was calculated on the basis of the resulting asset position. Contributions in any year are the product of the number of workers, average earnings and the contribution rate.

$$C_t = N_t \cdot (P/N)_{1975} (1+g)^t \cdot a_t$$

when N_t = number of workers in year t

$(P/N)_{1975}$ = average earnings in 1975

g = rate of growth of average earnings

a_t = contribution rate in year t

The benefit calculation was quite similar.

$$B_t = BN_t \cdot (P/N)_{1975} (1+g)^t \cdot \beta_t$$

when BN_t = number of beneficiaries in year t

β_t = ratio of benefit to average earnings

Table 11

CONTRIBUTIONS TO CIVIL SERVICE RETIREMENT SYSTEM, FISCAL 1975

	Percentage of Payroll[a]		Amount (in millions)	
	Total[b]	Paid	Total[b]	Paid
Employee	7.00	7.00	$2,495	$2,495
Employing Agency	7.00	7.00	2,495	2,495
Interest on Unfunded Liability (50 Percent Payable)	12.68	6.34	4,522	2,261
Increase in Unfunded Liability (after October 1969)	3.72	3.72	1,326	1,326
Postal Service Increase in Unfunded Liability	1.18	1.18	420	420
Military Service Credit	1.14	.57	408	204
	32.72	25.81	11,666	9,201

[a]The contributions as a percent of payroll were calculated on the basis of a payroll $35,643 million which was estimated by dividing the employees' contribution of $2,495 by .07.

[b]Total contributions are calculated on the assumption that the phase-in for the interest and military payment was completed, and 1980 rates were applicated to 1975 payrolls.

Source: Based on data from U.S. Civil Service Commission, *Annual Report of Financial and Statistical Data for Fiscal Year Ended June 30, 1975,* Table A-4, pp. 8-9.

Table 12

BENEFITS, RECEIPTS AND ASSETS OF CIVIL SERVICE RETIREMENT SYSTEM, FISCAL YEARS 1950-75
(millions of dollars)

	Benefits	Receipts				
		Total	Contributions		Earnings on Investment	Financial Assets
			Government	Employee		
1950	$ 266	$ 804	$ 305	$ 356	$ 143	$ 3,842
1951	269	847	307	375	165	4,420
1952	299	916	313	415	188	5,034
1953	361	960	325	420	215	5,636
1954	409	686	35[a]	425	226	5,913
1955	428	707	33[a]	440	234	6,193
1956	504	1,020	237	571	212	6,709
1957	588	1,392	531	640	221	7,512
1958	696	1,453	584	675	194	8,269
1959	792	1,736	754	762	220	9,213
1960	893	1,761	749	760	251	10,081
1961	963	2,027	890	856	282	11,145
1962	1,061	2,082	896	864	323	12,166
1963	1,176	2,247	951	934	362	13,238
1964	1,320	2,456	1,042	994	420	14,374
1965	1,438	2,664	1,115	1,067	482	15,601
1966	1,689	2,823	1,164	1,113	546	16,736
1967	1,969	3,094	1,264	1,206	625	17,861
1968	2,137	3,431	1,389	1,336	709	19,158
1969	2,410	3,753	1,486	1,430	837	20,500
1970	2,752	4,683	1,952	1,740	990	22,432
1971	3,230	5,816	2,663	1,920	1,233	25,018
1972	3,748	6,748	3,206	2,073	1,464	27,982
1973	4,588	7,611	3,902	2,140	1,569	30,980
1974	5,785	8,995	4,840	2,310	1,846	34,184
1975	7,207	11,377	6,707	2,534	2,136	38,351

[a]1954 and 1955 Congress failed to make full appropriations.

Source: U.S. Civil Service Commission, Bureau of Retirement, Insurance and Occupational Health, *Annual Report of Financial and Statistical Data for Fiscal Year Ended June 30, 1962,* Table C-1, for *Fiscal Year Ended* June 30, 1970, Table C-1, for *Fiscal Year Ended June 30, 1974,* Table B-1, for *Fiscal Year Ended June 30, 1975,* Table B-1.

Table 13

COMPARISON OF STATE-LOCAL, CIVIL SERVICE AND MILITARY RETIREMENT PLANS

Characteristic	State-Local	Civil Service	Military
Age and/or Service for Retirement	Age 60-65 with 20-30 Years of Service	Age 62 with 5 Years Age 60 with 20 Years Age 55 with 30 Years	20 Years of Service
Calculation of Benefit	1 1/2 to 2 Percent Per Year of Service	1 1/2 Percent First 5 Years 1 3/4 Percent Second 5 Years 2 Percent for Years over 10 Maximum: 80 Percent of Salary	2 1/2 Percent Per Year of Basic Pay. Maximum: 75 Percent of Basic Pay
Base for Calculating Benefit	Basically High 3-5 Years	High 3	Terminal Basic Pay
Cost-of-Living Adjustment	Automatic Adjustments are Common; Generally Limited to 3 Percent	Automatic	Automatic
Vesting	After 5-10 Years	After 5 Years	None
Social Security Offset	About 85 Percent of Employees are Covered by Social Security; 25 Percent Provide an Offset or Step Rate Formula with Fixed Dollar Integration Level	None	None
Employee Contribution	More than 90 Percent are Contributory; 3 to 8 Percent of Salary	7 Percent of Salary	None
Funding	Partial	Partial	Pay-as-you-go

Source: Defense Manpower Commission, *Defense Manpower: The Keystone of National Security,* Report to the President and the Congress, April 1976, Table VIII-13, pp. 370-372.

The estimates presented in Tables 14-16 are based on a 5 percent wage growth assumption, 2 percent productivity and 3 percent inflation. An interest rate of 6 percent is used to calculate the earnings on investment. The specific assumptions for the individual system estimates are summarized below, while the data underlying the projections are presented in Appendix Table A-1.

State-Local

The contribution projections required an estimate of future employment and annual contribution rates. Employment was based on the Bureau of the Census population projections and was estimated for two groups — education and noneducation. State-local workers employed in education were projected on the basis of the increasing ratio of teachers to population aged 5-24, while noneducation employment was based on the rising ratio of state-local workers to the adult population. The projects and underlying assumptions are presented in Appendix Table A-2. Essentially, state-local employment is projected to grow 2 to 3 percent annually between now and the year 2000, increasing from 12 million persons in 1975 to 23 million by 2000.

Two alternative sets of assumptions were made for the contribution rates. First, total employee and government contributions were assumed to remain at the 1975 level of 11.8 percent of payrolls. With this contribution rate, the assets on state-local trust funds would continue to grow until 1994 after which time the funds would be rapidly depleted and would be exhausted early in the twenty-first century. A second set of assumptions provided for a slight increase in the contribution rate averaging 0.7 percent every five years — reaching 15.4 percent by the year 2000. Even with this higher rate, the trust funds would start to decline after 1999. An increasing contribution rate, even with current funding objectives, is probably the more realistic assumption since there has been a secular increase in the ratio of contributions to payrolls since 1960.

The benefit projection required an estimate of the number of beneficiaries in each year and the ratio of benefits to average earnings. Beneficiaries were assumed to increase by 6.1 percent each year. This figure reflected a continuation of the annual increase in beneficiaries experienced between 1960 and 1975.

The ratio of benefits to average earnings has increased from 40 to 45 percent between 1970 and 1975. For the projections, this proxy for replacement rate was assumed to rise to 53 percent in 1980 and then increase to 60 percent by 1990, where it was assumed to remain constant until the year 2000. This projected increase was designed to reflect the liberalization of benefits legislated in the last ten years. Furthermore, a 60 percent ratio of benefits to *average* earnings seemed consistent with the provisions of the "typical" state-local plan which calculates benefits as 50 percent of the five years of highest earnings in the ten years prior to retirement.

Table 14

PROJECTIONS OF BENEFITS, RECEIPTS AND ASSETS FOR STATE-LOCAL RETIREMENT SYSTEMS UNDER CURRENT FINANCIAL ARRANGEMENTS, FISCAL YEARS 1975-2000
(millions of dollars)

	Benefits	Receipts			Financial Assets
		Total	Contributions	Earnings on Investment	
1975	$ 7,490	$ 18,898	$ 13,604	$ 5,294	$ 98,064
1976	8,629	20,882	14,999	5,883	110,317
1977	9,942	23,156	16,537	6,619	123,531
1978	11,454	25,645	18,233	7,412	137,722
1979	13,197	28,366	20,103	8,263	152,891
1980	15,204	31,337	22,164	9,173	169,024
1981	17,241	34,233	24,092	10,141	186,016
1982	19,552	37,349	26,188	11,161	203,813
1983	22,172	40,696	28,467	12,229	222,337
1984	25,142	44,283	30,943	13,340	241,478
1985	28,549	48,162	33,673	14,489	261,091
1986	32,032	52,234	36,569	15,665	281,293
1987	35,940	56,592	39,714	16,878	301,945
1988	40,324	61,246	43,129	18,117	322,867
1989	45,244	66,210	46,838	19,372	343,833
1990	50,684	71,473	50,843	20,630	364,622
1991	56,462	77,042	55,165	21,877	385,202
1992	62,899	82,966	59,854	23,112	405,269
1993	70,069	89,257	64,941	24,316	424,457
1994	78,057	95,928	70,461	25,467	442,328
1995	86,971	103,047	76,507	26,540	458,404
1996	96,886	110,284	82,780	27,504	471,802
1997	107,931	117,876	89,568	28,308	481,747
1998	120,235	125,818	96,913	28,905	487,330
1999	133,942	134,100	104,860	29,240	487,488
2000	149,251	142,833	113,584	29,249	481,070

Source: Authors' Estimates. See Text.

Table 15

PROJECTIONS OF BENEFITS, RECEIPTS AND ASSETS FOR THE CIVIL SERVICE RETIREMENT SYSTEM UNDER CURRENT FINANCIAL ARRANGEMENTS, FISCAL YEARS 1975-2000
(millions of dollars)

	Benefits	Receipts Total	Receipts Contri-butions	Earnings on Investment	Financial Assets
1975	$ 7,207	$11,377	$ 9,241	$ 2,136	$ 38,351
1976	7,948	12,613	10,312	2,301	43,016
1977	8,765	14,088	11,507	2,581	48,339
1978	9,666	15,740	12,840	2,900	54,413
1979	10,660	17,594	14,329	3,265	61,347
1980	11,756	19,670	15,989	3,681	69,261
1981	12,827	21,168	17,012	4,156	77,602
1982	13,995	22,757	18,101	4,656	86,364
1983	15,270	24,442	19,260	5,182	95,536
1984	16,661	26,224	20,492	5,732	105,099
1985	18,179	28,111	21,805	6,306	115,031
1986	19,456	29,993	23,091	6,902	125,568
1987	20,824	31,988	24,454	7,534	136,732
1988	22,287	34,101	25,897	8,204	148,546
1989	23,853	36,337	27,424	8,913	161,030
1990	25,529	38,670	29,008	9,662	174,171
1991	27,119	41,140	30,690	10,450	188,192
1992	28,807	43,762	32,470	11,292	203,147
1993	30,601	46,543	34,354	12,189	219,089
1994	32,506	49,491	36,346	13,145	236,074
1995	34,530	52,732	38,568	14,164	254,276
1996	36,524	56,139	40,882	15,257	273,891
1997	38,632	59,768	43,335	16,433	295,027
1998	40,863	63,637	45,935	17,702	317,801
1999	43,222	67,759	48,691	19,068	342,338
2000	45,717	72,079	51,539	20,540	368,700

Source: Authors' Estimates. See Text.

Table 16

PROJECTIONS OF BENEFITS, RECEIPTS AND ASSETS FOR THE MILITARY RETIREMENT SYSTEMS UNDER CURRENT FINANCIAL ARRANGEMENTS, FISCAL YEARS 1975-2000
(millions of dollars)

Year	Benefits	Receipts Total	Receipts Contributions	Earnings on Investment	Assets
1975	$ 6,149	$ 6,149	$ 6,149	—	—
1976	6,708	6,708	6,708	—	—
1977	7,317	7,317	7,317	—	—
1978	7,982	7,982	7,982	—	—
1979	8,708	8,708	8,708	—	—
1980	9,499	9,499	9,499	—	—
1981	10,196	10,196	10,196	—	—
1982	10,944	10,944	10,944	—	—
1983	11,747	11,747	11,747	—	—
1984	12,609	12,609	12,609	—	—
1985	13,534	13,534	13,534	—	—
1986	14,396	14,396	14,396	—	—
1987	15,314	15,314	15,314	—	—
1988	16,289	16,289	16,289	—	—
1989	17,327	17,327	17,327	—	—
1990	18,431	18,431	18,431	—	—
1991	19,501	19,501	19,501	—	—
1992	20,633	20,633	20,633	—	—
1993	21,831	21,831	21,831	—	—
1994	23,099	23,099	23,099	—	—
1995	24,440	24,440	24,440	—	—
1996	25,669	25,669	25,669	—	—
1997	26,959	26,959	26,959	—	—
1998	28,314	28,314	28,314	—	—
1999	29,737	29,737	29,737	—	—
2000	31,232	31,232	31,232	—	—

Source: Authors' Estimates. See Text.

The results of employing these various contribution and benefit assumptions are shown in Table 14. In this scenario, contributions from employees and state-local governments exceed benefit payments through 1989 and the assets in the trust fund grow as a result of increasing interest income and the excess of contributions over benefits. After 1989, an increasing proportion of interest income is used to meet benefit commitments, but the fund continues to grow although at a declining rate. Finally, in 2000 benefit commitments exceed all sources of income and some of the accumulated assets must be used for benefit payments resulting in an actual decline in the trust funds. In the next section, these flows and asset positions will be compared to those required for a fully funded system.

Civil Service

While the assumptions underlying the state-local projections are, by necessity, quite speculative, the projections for the Civil Service Retirement System are based on considerably better information. Employment growth has been more stable, beneficiary data are available and future contribution rates have been established.

Civil service employment grew unevenly from 1950 to 1975 reflecting the onset of two wars and interest in space technology as well as their termination. Over the period, the annualized growth rate was 1.3 percent. In keeping with the expectation that civil service employment has leveled off and that growth over the next quarter century will be slower reflecting tightened government budgets and demographic shifts, growth for 1975-2000 is assumed to average about one-half that of the 1950-1975 period or 0.6 percent per year. With this assumption, the Federal Government will employ approximately 3.3 million workers in the year 2000.

As shown in Table 11, contributions to the Civil Service Retirement Fund amounted to 25.81 percent of payrolls in fiscal 1975. By 1980, when the phase-in for the interest payment on the unfunded liability is completed, the total contribution rate should amount to 32.72 percent. Thereafter, the contribution rate was assumed to increase by 0.55 percent every five years to reflect financing of additional increases in unfunded liability occurring after 1969.

Civil service data on beneficiaries showed a significant increase from 1.4 to 1.9 million between 1975 and 1985 reflecting the high levels of government employment during World War II. After 1985, beneficiary growth slows substantially, reaching 2.2 million by the year 2000.

The ratio of benefits to average earnings amounted to about 35 percent in 1975. This ratio is assumed to increase to 39 percent by 1985 reflecting the large influx of new beneficiaries and then to grow slowly thereafter, reaching 42 percent by the year 2000.

As shown in Table 15, with these assumptions contributions to the Civil Service Retirement Fund will exceed benefit payments for the next 25 years, thereby allowing the fund to retain the interest income as well as

adding excess contributions. By the year 2000, assets will be approximately seven times benefit payments compared to the present five-to-one ratio. Nevertheless, the present unfunded liability of about $165 billion will not have been reduced and Section III will show the impact of amortizing this liability in addition to making the scheduled contributions.

Military

Since military pensions are noncontributory and financed on a pay-as-you-go basis, contributions will always equal benefits under the current financing scheme. Benefit projections were made on the basis of projected beneficiaries and ratio of benefits to earnings. Beneficiaries were projected to 1980 by the military[11] and projections to the year 2000 were calculated by extrapolating the declining growth rate of the 1975-85 period to zero in 1995 after which time the number of beneficiaries was held constant.

Before 1970, the ratio of average benefit to average payroll was considerably in excess of one. However, in 1970 military salary scales were adjusted upward and the ratio of benefit to average earnings has been close to 0.80 since that time. This ratio was incorporated in the benefit calculations which are presented in Table 16.

Summary

These projections for the civil service, state-local and military retirement systems will provide a basis of comparison for the financial flows resulting from full funding of the three programs and therefore it is useful to evaluate their reliability. These baseline projections require many judgmental assumptions about the future number of beneficiaries and contributors as well as the ratio of contributions and benefits to average earnings. Contributors were estimated on the basis of future employment, which is relatively predictable for civil service and the military (provided there are no major wars) but quite speculative for state and local governments. Contributions as a percent of payrolls have been established in law for civil service and for the military, which is financed on a pay-as-you-go basis, contributions will equal benefit payments. However, for state-local governments it was assumed that the ratio of contributions to payrolls would continue to increase as in the past, which may or may not be correct. Beneficiary data for the civil service and military are reasonably certain, but the beneficiary projections for state-local governments, which are based on an assumed continuation of the historical rate of increase, are considerably less reliable. The other key assumption is the ratio of benefits to average earnings. Here again, the estimates for the military are the most solid since the ratio has been steady. For civil service

[11] *Pay and Allowances of the Uniformed Services and Supplementary Material,* prepared for the Committee on Armed Services, U.S. House of Representatives (Washington, D.C. 1975), Table 5a.

and state-local governments, the ratio has been increasing and considerable arbitrariness was involved in deciding how fast this ratio would continue to rise and where it would level off.

It is important to emphasize that these baseline projections are speculative because they play a crucial role in determining the impact of funding. For instance, if the forecasts of contributions are overestimated, then a comparison with contributions of fully funded programs will understate the impact of funding. On the other hand, if these contribution schedules are too low, the additional saving resulting from full funding will be exaggerated.

III. Funding the Systems

This section is devoted to determining the amount of contributions required to meet the ultimate cost of fully funding the civil service, military, and state and local retirement systems. Comparing these costs to the baseline projections will reveal the increase in saving and capital accumulation from changing the financing schemes. Full funding of these systems should not necessarily be viewed as a policy goal since other financial arrangements would also be fiscally responsible but rather as the maximum increase in capital accumulation to be derived from this form of financing.

The contributions required to fully fund each of these systems must cover two components: an amortization payment to eliminate the existing unfunded liability and a payment to cover the normal cost. The accrued liability is equivalent to the present value of all future benefit payments based solely on prior years of service and is calculated taking into account life expectancies and withdrawal rates for all current employees and retirees. The accrued unfunded liability is simply the amount by which the liability exceeds current assets. The amortization payment is the annual cost of eliminating the unfunded liability over a number of years and can be calculated either as a level dollar amount or as an amount that will be a level percent of covered payroll. Finally, the normal cost is the amount which must be contributed in a given year to cover the cost of benefits earned in that year.

Three independent estimation techniques were employed to determine the costs of fully funding each system. These methods include 1) trend extrapolation to calculate the present value of benefits (accrued to date and future accruals) to current system members less the present value of contributions from current members calculated at normal cost, 2) estimation of unfunded liability based on a hypothetical mature trust fund, and 3) quasi-actuarial analysis to estimate directly the unfunded liability and normal cost.

1. Trend Extrapolation

This method consists of estimating the present value of future benefit payments to all members of the system and current retirees as well as the present value of the contributions of current members calculated at a rate

which covers normal cost (calculated under method 3). The difference between these two calculations will yield a value of the accrued liability which less current assets will equal the unfunded liability.

The methodology is very similar to that used for the baseline projections except 1) beneficiaries include only those individuals who were members of the system in 1975, 2) contributors include only current covered workers, and 3) the contribution rate is set at a level which will cover the cost of additional benefits earned in each year.

Future benefits were projected to the year 2025 by estimating the ratio of benefits to average earnings and the total number of beneficiaries, then the total benefit figure for each year was discounted back to the present. Therefore, the present value of benefits was equal to

$$PVB^{I} = \sum_{t=1}^{50} \frac{BN^{I}_{t} \left(\frac{P}{N}\right)_{1975} (1+g)^{t} \cdot \beta_{t}}{(1+d)^{t}}$$

where PVB^{I} = present value of future benefits to current members of the system and current retirees

BN^{I}_{t} = number of beneficiaries in year t who were members of the system in 1975

$\left(\frac{P}{N}\right)_{1975}$ = average earnings in 1975

β_{t} = ratio of benefits to average earnings

d = interest rate by which future benefits are discounted

g = rate of growth of average earnings

Members of the system in 1975 were presumed to comprise a declining portion of total beneficiaries in each year. In the near future, present members continue to make up most of the beneficiary group; however, after 1985 the proportion of beneficiaries represented by current members declines more rapidly due to mortality and the typically high withdrawal rates of younger workers.[12] (See Appendix Table A-3.)

[12]Beneficiaries were fit to a third order polynomial: Construction of the specific curve was quite arbitrary since only two of the required four points were known, i.e., the number in 1975 and 0 in 2025. The intermediate points were estimated from recent retirement trends and rate of decrement.

Future contributions from current members of the three systems were projected to the year 2015 by the following equation.

$$PVC' = \sum_{t=1}^{40} \frac{N_t' \cdot (\frac{P}{N}) 1975 (1+G)^t \cdot a_t}{(1+d)^t}$$

where N_t' = number of workers in year t who were employed in 1975

PVC' = present value of future contributions from current members of the system

a_t = contribution rate set to cover normal cost

A very crude approximation was made of the annual decline in contributors from the current group due to death, disability and retirement.[13] By 2010, only a small number of contributors from the original group remained and these individuals were assumed to retire or die in the next five years leaving no contributors in the year 2015.

The contribution rate was set at the normal cost so that contributions in any future year exactly cover the value of benefits accruing in that year which prevents any accumulation of additional unfunded liability. Therefore, once it is assumed all future contributions will cover normal cost, it is possible to calculate the value of the liability (L) accrued to date by subtracting the present value of future contributions from the present value of future benefits.

$$L = PVB' - PVC'$$

The unfunded liability (UFL) is then found by simply subtracting the value of current assets (CA) from the accrued liability.

$$UFL = L - CA$$

The results of the trend extrapolation are presented in Table 17. This methodology is extremely sensitive to the rate of decline of beneficiaries and contributors, indicating that a more detailed type of actuarial analysis is required to derive the future flow of benefits and contributions.

[13]The number of contributors were assumed to decline at a constant rate of approximately 7 percent.

Table 17

ESTIMATES OF UNFUNDED LIABILITY
BY TREND EXTRAPOLATION METHOD
FOR STATE-LOCAL, CIVIL SERVICE AND
MILITARY RETIREMENT SYSTEMS, 1975
(billions of dollars)

	State-Local	Civil Service	Military
Present Value			
Benefits	$437	$280	$277
Contributions	162	75	42
Assets	98	38	0
Unfunded Liability	177	167	235

Source: Authors' estimates.

2. Mature Trust Fund Model

This model was developed by J. Richard Aronson[14] to estimate the unfunded liability and amortization costs for state and local pension plans. The assets required for full funding of a retirement system are estimated by placing static constraints on the system which assures that the trust fund reaches a calculable maximum. A system is defined as mature if the following conditions hold:

number of employees hired = number retiring
number of employees dying = number retiring
total payroll is constant

For such a system there exists a hypothetical maximum trust fund (called Mature Trust Fund) which would be sufficient to meet all the plan's obligations even if membership in the system declined or no new members were accepted. The mature system is fully funded when the value of the mature trust fund is equal to the present value of the pension payments to all members of the system until the last member has died less the present value of contributions until the last employee retires.

$$MTF = \sum_{n=1}^{d} \frac{Bn}{(1+i)^n} - \sum_{n=1}^{R} \frac{Cn}{(1+i)^n}$$

where Bn = benefits in year n

Cn = contributions in year n

i = interest rate

d = year last retiree dies

R = year last employee retires

[14]J. Richard Aronson, "Projections of State and Local Trust Fund Financing," with David J. Ott and others, *State-Local Finances in the Last Half of the 1970s* (American Enterprise Institute for Public Policy Research, 1975), pp. 63-90.

Since contributions can be expressed as a percent of covered payroll

$$C_n = a\,PR_n$$

where a = constant percent of covered payroll

PR_n = covered payroll in year n

The expression for MTF may then be rewritten as

$$MTF = \sum_{n=1}^{d} \frac{B_n}{(1+i)^n} - \sum_{n=1}^{R} \frac{aPR_n}{(1+i)^n}$$

As long as the system is mature, MTF remains unchanged since membership, payroll and annual benefits and contributions are constant. During this period, the interest on the MTF does not accumulate but rather is used to pay that portion of benefits not met by current contributions. Therefore,

$$iMTF + a\bar{P} = B_c$$

solving for the contribution rate

$$a = B_c/\bar{P} - iMTF/\bar{P}$$

However, since both B_c and P are constant, $B_c/P = b$ and

$$a = b - \frac{iMTF}{\bar{P}}$$

Substituting this into the MTF equation gives

$$MTF = \sum_{n=1}^{d} \frac{B_n}{(1+i)^n} - \sum_{n=1}^{R} \frac{\left(b - \frac{iMTF}{\bar{P}}\right) PR_n}{(1+i)^n}$$

and rearranging gives a solution for MTF.

$$MTF = \frac{\sum_{n=1}^{d} \frac{B_n}{(1+i)^n} - \sum_{n=1}^{R} \frac{b\ PR_n}{(1+i)^n}}{1 - \frac{i}{\bar{P}} \cdot \sum_{n=1}^{R} \frac{PR_n}{(1+i)^n}}$$

Since the mature trust fund is the value of assets which must be accumulated if the system is to be fully funded, the accumulation of these assets requires the elimination of the unfunded balance. According to Aronson, the unfunded balance may be calculated as

$$UB = MTF - CA\ (1+i)^y$$

where CA = current assets

y = amortization period

However, this calculation will underestimate the value of UB because MTF is treated as earning no interest while CA accumulates interest for y years. Thus, UB shrinks over time rather than growing annually by the amount of foregone interest. In order to calculate the correct value for UB, all factors must be treated as present values. Thus

$$UB = MTF - CA$$

Calculating the mature trust fund and unfunded balance for each system required estimates for $\bar{P}$, B_n, d, b, PR_n, R and i. The model was run with i = 6 and i = 7 and the values of the remaining variables were set as follows:

The maximum covered payroll P was determined by allowing the actual 1975 payrolls to grow at a constant rate for a number of years until the system is assumed to have matured. These growth rates were set at 5 percent for the military, 5.6 percent for civil service and 7.7 percent for state and local reflecting the expected growth from the baseline projections. Payrolls were allowed to grow for either 10 or 15 years and results for both assumptions will be presented below.

To estimate B_n, the stream of future pension benefits after the plan stops accepting new members, an estimate must be made for d, the number of years until the last member dies. For civil service and state-local, d was set equal to 50 which consisted of a working life of 37 years and 13 years of retirement. For the military, the value of d was increased to 54 since these workers were assumed to enter the system at age 21.

The constant $b = \frac{B_c}{\bar{P}}$ is the maximum annual pension payment as a percent of the maximum payroll. This constant is equivalent to the expected ratio of beneficiaries to workers multiplied by the ratio of average benefit to average payroll. Using the baseline projections, b was set equal to 0.600 for the military, 0.282 for civil service and 0.202 for state-local systems.

The annual covered payroll (PR_n) starts to decline as soon as the plan stops accepting new members. The number of years over which the decline occurs depends on the estimated working life. For civil service and state-local systems, working life was assumed to extend from age 25 to age 62 or 37 years. For the military, the working life was calculated from age 21 to age 40 which amounted to 19 years. The model assumes that the covered payroll diminishes in equal decrements over the designated time period.

Estimates for the value of the mature trust fund (MTF) and unfunded balance (UB) are presented in Table 18. The value of UB for civil service and military are consistent with the value of unfunded liability calculated by the quasi-actuarial analysis in the next section. The results for the state-local systems are much too high. The unfunded liability for Massachusetts amounted to approximately \$7-8 billion in 1974[15] and probably was close to \$10 billion by the end of 1975. Assuming that all other states also ran their systems on a pay-as-you-go basis, that employees of other state-local governments were also not covered by Social Security and that their plans were as large and generous as Massachusetts would yield a maximum value for all state-local systems of \$500 billion. However, since all other states at least partially fund their retirement systems, employees of most other state and local plans are also covered by Social Security and few plans are as large and generous as Massachusetts, a more reasonable expectation for the value of aggregate state-local liability is about \$200-300 billion.

This model seems to yield good results for systems that are, in effect, mature. Both civil service and the military anticipate a reasonably steady level of employment and expect a stabilization of the ratio of beneficiaries to workers. In contrast, the state-local systems will experience a significant increase in the ratio of beneficiaries to workers due to a slowing of

[15]Massachusetts Retirement Law Commission, *Actuarial Valuation Report of the Contributory Retirement Systems of Massachusetts* (January 5, 1976).

Table 18

ESTIMATES OF MATURE TRUST FUND (MTF)
AND UNFUNDED BALANCE (UB) FOR STATE-LOCAL,
CIVIL SERVICE AND MILITARY RETIREMENT SYSTEMS, 1975

System	Interest Rate	Number of Years of Payroll Growth: 10 MTF (billions)	10 UB (billions)	15 MTF (billions)	15 UB (billions)
State-Local	6	$647.4	$549.3	$938.1	$840.0
	7	590.8	492.7	856.1	758.0
Civil Service	6	275.4	237.1	361.7	323.3
	7	251.3	213.0	330.0	291.7
Military	6	190.1	190.1	242.6	242.6
	7	172.8	172.8	220.6	220.6

Source: Authors' estimates.

the rapid growth in employment during the sixties. The next section will develop a more direct method of estimating the unfunded liability for state-local systems.

3. Quasi-actuarial

This estimation technique provides a crude actuarial valuation for each system. The present value of future benefits (accrued to date and future accruals) for current employees and retirees is calculated on the basis of detailed age, sex, and earnings data. Normal cost is estimated by dividing the present value of benefits by the present value of simulated lifetime earnings for all current employees. The normal cost rate is then applied to the present value of future earnings of current employees to arrive at the present value of contributions. The present value of benefits less the present value of future contributions calculated to cover normal cost less current assets yields the unfunded liability for each system. Amortizing the unfunded liability as a level percent of pay provides the contribution rate required to eliminate the liability which together with the normal cost rate yields the total contribution as the percent of pay necessary to fully fund each system. The projections to the year 2000 are reestimated using these full funding contributions to yield new asset accumulation for each year and these funded projections are compared with the baseline projections estimated in Section II to determine the impact of funding the retirement programs.

Present Value of Benefits

The present value of current employees' benefits is simply the sum of the discounted benefits for each employee. For any employee, the value of the retirement benefit expected in the first year of retirement is some fraction of average salary multiplied by the probability that the employee will remain in the system until retirement age.

$$PV\ B_F = [\beta \cdot W\ (1+g)^{r-1-a} \cdot P_{r_a}]\ /\ (1+d)^{(r-1-a)}$$

W = employee's current salary

$(1+g)^{(r-1-a)}$ = the growth of the employee's salary through his last working year. If benefits are based on high three years, salary is grown to two years prior to retirement and similarly salary is grown to three years prior to retirement for systems with benefits based on high five.

P_{r_a} = probability employee will remain in the system to retirement (r) given he is in the system at age a. This probability is constructed from multiple decrements of mortality, disability, and withdrawal.

$(1 + d)^{(r-1-a)}$ = discount factor to discount the benefit back to the present

β = ratio of benefit to preretirement earnings

The present value of an employee's total benefits until death must take into account life expectancy after retirement and cost-of-living adjustments to his benefit.

$$PVB_D = \left[\beta \cdot W\left(\frac{1+g}{1+d}\right)^{r-1-a}\right] \sum_{n=r+1}^{110} \left[P_{r_a} + P_{n+1_n}\left(\frac{1+c}{1+d}\right)^{n-r}\right]$$

where PVB_D = total value of benefits until death discounted to the present

P_{n+1_n} = Probability of living to age n+1, given that the employee lived to age n

$(1 + c)^{n-r}$ = Factor to adjust benefits after retirement for increases in the cost of living

$(1 + d)^{n-r}$ = Factor to discount benefits after retiremer back to value at retirement age

Given an age, sex, salary distribution of employees in each system and data on life expectancies, disability and retirement rates, an estimate for each age-sex group can be found by multiplying the benefits in each year by the number of individuals expected to receive them. Therefore, the present value of benefits for a particular age-sex group is as follows:

$$PVB_S = \left[\beta \cdot W_S \left(\frac{1+g}{1+d}\right)^{r-1-a}\right]\left[N_S \cdot {}_{r_a}P + \sum_{n=r+1}^{110} N_n \; {}_{n+1}P_n \left(\frac{1+c}{1+d}\right)^{n-r}\right]$$

where PVB_S = present value of benefits for a particular age-sex group

W_S = average earnings for age-sex group

N_S = number of employees originally in age-sex group

Summing the values of PVB_s for each age-sex group gives the total expected benefits for employees of a given system. To obtain the present value of total expected benefits, the future benefits for each age group of current retirees must also be estimated.

$$PVB_R = B_R \left[N_R + \sum_{n=r+1}^{110} N_n {}_{n+1}P_n \left(\frac{1+c}{1+d}\right)^{n-r}\right]$$

where B_R = the existing average benefit for a particular age group of retirees

N_R = number of beneficiaries originally in age-sex group

The total present value of future benefits to current employees and retirees is the sum of all the age group values.

$$PVB_T = \sum_{s=1}^{b} PVB_S + \sum_{R=1}^{f} PVB_R$$

Normal Cost

The accrued liability for a system can be calculated by subtracting from the present value of future benefits the present value of future contributions calculated at a rate which covers normal cost. An entry age normal cost can be calculated as the ratio of the present value of future

benefits for current employees to the present value of total covered payroll for those employees. Total covered payroll can be calculated by simulating an earnings history from age of entry into the system to retirement for all current employees.

Since the entry age for each employee is not known, age 30 is assumed to be the entry age for all persons 30 and over while for those under 30 the current age is taken as age of entry.[16] For persons over 30, entry age salary is calculated by reducing the worker's current salary by the assumed growth in wages for each year from his current age back to age 30. To calculate the present value of lifetime payroll for a given age-sex group, the shrunken salaries are multiplied by the number of individuals in the age group until the summation reaches the actual age, after which point the number of individuals is reduced by the decrement factor for withdrawal, disability or death. Therefore,

$$PVP_s = W_e \left[N_s + \sum_{n=e}^{a-1} (1+g)^{n-e}(1+d)^{a-n} \cdot N_s \right] + W_s \left[N_s + \sum_{n=a+1}^{r-1} \left(\frac{1+g}{1+d}\right)^{n-a} \cdot P_{n+1_n} N_n \right]$$

where W_e = earnings at entry age calculated by reducing current salary for the age-sex group by the growth rate of wages, i.e., $W_e = W_s/(1+g)^{a-e}$

Earnings histories are simulated for each age-sex group and summed to achieve the total payroll from entry age to retirement for each system.

$$PVP_T = \sum_{s=1}^{b} PVP_s$$

Since a normal cost contribution exactly covers the cost of benefits earned

$$PVB_T = PVP_T \cdot x$$

where x = normal cost

Rearranging to solve for normal cost

$$x = \frac{PVB_T}{PVP_T}$$

[16]For the military, an entry age of 19 was assumed for enlisted men and age 23 for officers.

Unfunded Liability

Once the normal cost is estimated, the accrued liability is calculated by subtracting the present value of normal cost contributions from the present value of total future benefits for current members of the system and present retirees. The present value of future earnings of current workers is as follows:

$$PVE_s = W_s \left[N_s + \sum_{n=a+1}^{r-1} \left(\frac{1+g}{1+d} \right)^{n-a} \cdot P_{n+1_n} \cdot N_n \right] \text{ and } PVE_T = \sum_{s=1}^{b} PVE_s$$

Future contributions of these workers calculated on the basis of entry age normal cost equal

$$PVC_T = x \cdot PVE_T$$

The accrued liability is then equal to

$$L = PVB_T - PVC_T$$

As before, the unfunded liability is found by subtracting the value of current assets (CA) from the accrued liability (L).

$$UFL = L - CA$$

The unfunded liability is amortized, both as a level dollar amount and as a percent of pay, to determine the rates of contribution required to eliminate the liability over a period of 40 years. The amortization payment as a level dollar amount is

$$A_n = \frac{UFL\,(1 - 1/1 + d)}{1 - \left(\frac{1}{1+d} \right)^y}$$

where y = the period over which UFL is amortized

As a level percent of pay, the amortization payment is calculated using an alternative formula.

$$A_n = \frac{UFL\ 1 - \left(\frac{1}{1+d'}\right)}{1 - \left(\frac{1}{1+d'}\right)^y}$$

$$\text{where } d' = \left(\frac{1+d}{1+g}\right) - 1$$

The amortization rate and the normal cost accrual rate together represent the percent of payroll that must be contributed to fund the system.

Applying the Model

The quasi-actuarial model was tested using data for civil service for 1972. These results were then compared with those published in the Report of the Board of Actuaries of the Civil Service Retirement System. The comparison is presented in Table 19 under two sets of assumptions for inflation, interest rate, and wage growth. Although the model is considerably cruder than the techniques used by the civil service actuaries, the results are quite close. On the basis of these results, the model was used to estimate the unfunded liability for 1974 for the military, civil service and aggregate state-local systems. The 1975 liability was calculated by adding the difference between the sum of foregone interest and normal cost for 1975 and actual 1975 contributions.

For the civil service valuation, the following data were provided by the system's actuaries: age-sex earnings distribution for current employees, withdrawal and disability rates which combined with mortality rates from a group annuity table were used to construct a multiple decrement table, and finally an age-sex benefit distribution for disability, age-service and survivor beneficiaries. For simplicity, it was assumed that all survivors were widows.

The Department of Defense provided age-service-earnings data for military personnel all of whom were assumed to be male. Also supplied was the multiple decrement table for withdrawal, disability and death used

Table 19

VALUATION OF CIVIL SERVICE RETIREMENT SYSTEM, ANNUAL REPORT AND MODEL, 1972

	Static		Dynamic	
	Civil Service	Model	Civil Service	Model
	(Percent)			
I. Actuarial Assumptions				
1. Interest Rate	5	5	6	6
2. Inflation Rate	0	0	4	4
3. CPI plus 1% Bonus	0	0	5	5
4. Wage Growth	2.25	2.25	5.25	5.25
	(Millions of Dollars)			
II. Valuation Results				
1. Present Value of Future Benefits				
a. Retired Employees	38,572	37,615	57,136	57,272
b. Active Employees	111,782	112,002	224,292	202,691
Total	150,354	149,617	281,428	259,963
2. Entry Age Normal Cost Accrual Rate (Percent)	13.64	12.98	28.74	26.86
3. Present Value of Future Normal Cost Contributions	36,145	30,501	88,415	71,610
4. Gross Accrued Liability	114,209	119,116	193,013	188,353
5. Assets	27,990	27,990	27,990	27,990
6. Net Accrued Liability	86,219	91,126	165,023	160,363

Source: *Board of Actuaries of the Civil Service Retirement System Fifty-Second Annual Report,* July 8, 1975, Table 6, p. 9 and authors' estimates.

in the official valuations of the military retirement system.[17] In addition, the Department of Defense provided an age-sex-benefit distribution of disability, service and survivor beneficiaries.

For state-local systems, no comparable data were readily available. Dale Jorgenson, professor at Harvard University, supplied an age-sex earnings distribution for state-local employees which he has constructed on the basis of employment totals from the BLS.[18] State-local beneficiaries were assumed to be distributed in the same manner as civil service beneficiaries. Withdrawal, disability and mortality rates were also based on civil service data.

The normal costs and unfunded liabilities for each system under three sets of assumptions are presented in Table 20. In addition, the table includes the costs of amortizing the unfunded liability over 40 years both as a level percent of pay and a level dollar amount. The magnitudes of the unfunded liabilities seem reasonable and are consistent with published estimates for 1972 from civil service and for 1975 from the military.[19] The state-local figure is also close to the predicted value, although there are no published estimates with which to compare. The relationship between the three calculations seems reasonable. Comparing the first two sets of estimates for civil service and the military reveals the substantial impact on unfunded liability and normal cost of eliminating the additional 1 percent "bonus" for cost-of-living increases after retirement. A comparison of the second and third sets of estimates indicates the sensitivity of the calculations to a 1 percentage point increase in the interest rate.

Since the earlier baseline projections were calculated on an assumed wage growth of 5 percent and interest rate of 6 percent, the first set of estimates in Table 20 were used to derive the impact of funding. These normal costs and amortization rates (as level percents of pay) were applied to projected payrolls and the flow of benefits, contributions and earnings on investment were recalculated for each system (see Tables 21-23). The

[17]The decrement table used for official valuations of the military retirement system is a 1965 multiple decrement table with Department of Defense composites adjusted to June 30, 1973 force structure.

[18]Jorgensen's methodology for allocating workers by age, sex and earnings is described in F. Gollop and D. W. Jorgensen, "U.S. Total Factor Productivity by Industry, 1947-1973," paper delivered at Conference on New Developments in Productivity Measurement, Williamsburg, Va., Nov. 13-14, 1975.

[19]The estimate for the military is in line with the General Accounting Office estimate of an unfunded liability of $194 billion based on 5.5 percent wage growth, 7 percent interest rate and 5 percent cost-of-living adjustment. The higher interest rate assumption for the GAO estimate offsets most of the higher wage growth and cost-of-living assumption. Moreover, the published valuation was based on considerably higher post-retirement mortality rates (1937 Standard Annuity Table versus 1971 Group Annuity Table) which explains the balance of the difference. For further detail see *A Contributory Retirement System for the Military Personnel,* Report to the Chairman of the Task Force on National Defense, Senate Budget Committee by Comptroller General of the United States, (Washington, D.C., March 4, 1976).

Table 20

ESTIMATES OF UNFUNDED LIABILITY AND NORMAL COST FOR STATE-LOCAL, CIVIL SERVICE AND MILITARY RETIREMENT SYSTEMS BY QUASI ACTUARIAL METHOD, 1975

		Amortization Payment				Normal Cost		Total Cost (Level Percent)
		Level Dollar Amount		Level Percent of Payroll				
	Unfunded Liability (billions)	Dollar Payment (billions)	Percent of Payroll	Percent of Payroll	Dollar Payment in 1975 (billions)	Dollar Payment in 1975 (billions)	Percent of Payroll	Percent of Payroll
Wage Growth = 5% Interest = 6% Cost-of-Living = 3%								
State-Local	$270.3	$17.0	14.6	7.0	$8.1	$19.0	16.4	23.3
Civil Service	164.3	10.3	24.0	11.4	4.9	8.9	20.6	32.1
Military	195.0	12.2	78.9	37.6	5.8	6.7	43.5	81.1
Wage Growth = 5% Interest = 6% Cost-of-Living = 4%								
State-Local	310.3	19.5	16.8	8.0	9.3	21.0	18.1	26.1
Civil Service	186.4	11.7	27.2	13.0	5.6	9.8	22.8	35.7
Military	224.7	14.1	90.9	43.4	6.7	7.9	50.9	94.3
Wage Growth = 5% Interest = 7% Cost-of-Living = 4%								
State-Local	271.3	19.0	16.4	8.3	9.6	16.7	14.4	22.7
Civil Service	164.8	11.6	26.9	13.5	5.8	7.8	18.1	31.6
Military	195.7	13.7	88.5	44.5	6.9	6.0	38.8	83.3

NOTE: Numbers may not add due to rounding.

Source: Authors' estimates.

Table 21

BENEFITS, RECEIPTS AND ASSETS OF STATE AND LOCAL GOVERNMENT RETIREMENT SYSTEMS WITH FULL FUNDING, FISCAL YEARS 1975-2000
(millions of dollars)

Year	Benefits	Receipts			Assets
		Total	Contributions	Earnings on Investment	
1975	$ 7,490	$ 18,898	$ 13,604	$ 5,294	$ 98,064
1976	8,629	35,050	29,166	5,884	124,485
1977	9,942	38,994	31,525	7,469	153,537
1978	11,454	43,287	34,075	9,212	185,370
1979	13,197	47,953	36,831	11,122	220,126
1980	15,204	53,019	39,811	13,208	257,941
1981	17,241	58,345	42,869	15,476	299,045
1982	19,552	64,105	46,162	17,943	343,598
1983	22,172	70,324	49,708	20,616	391,750
1984	25,142	77,032	53,527	23,505	443,640
1985	28,549	84,257	57,639	26,618	499,348
1986	32,032	92,050	62,089	29,961	559,366
1987	35,940	100,445	66,883	33,562	623,871
1988	40,324	109,480	72,048	37,432	693,027
1989	45,244	119,193	77,611	41,582	766,976
1990	50,684	129,622	83,603	46,019	845,914
1991	56,462	140,730	89,975	50,755	930,182
1992	62,899	152,644	96,833	55,811	1,019,930
1993	70,069	165,409	104,213	61,196	1,115,270
1994	78,057	179,072	112,156	66,916	1,216,285
1995	86,971	193,681	120,704	72,977	1,322,995
1996	96,886	208,976	129,596	79,380	1,435,085
1997	107,931	225,248	139,143	86,105	1,552,402
1998	120,235	242,537	149,393	93,144	1,674,704
1999	133,942	260,881	160,399	100,482	1,801,643
2000	149,251	280,314	172,215	108,099	1,932,706

Source: Author's estimates. See Text.

Table 22

BENEFITS, RECEIPTS AND ASSETS OF CIVIL SERVICE RETIREMENT SYSTEM WITH FULL FUNDING, FISCAL YEARS 1975-2000
(millions of dollars)

Year	Benefits	Receipts			Assets
		Total	Contributions	Earnings on Investment	
1975	$ 7,207	$11,377	$ 9,241	$ 2,136	$ 38,351
1976	7,948	16,892	14,591	2,301	47,295
1977	8,765	18,251	15,413	2,838	56,781
1978	9,666	19,688	16,281	3,407	66,803
1979	10,660	21,206	17,198	4,008	77,349
1980	11,756	22,807	18,166	4,641	88,400
1981	12,827	24,570	19,266	5,304	100,143
1982	13,995	26,441	20,432	6,009	112,589
1983	15,270	28,423	21,668	6,755	125,742
1984	16,661	30,524	22,979	7,545	139,604
1985	18,179	32,746	24,370	8,376	154,171
1986	19,456	34,966	25,716	9,250	169,681
1987	20,824	37,318	27,137	10,181	186,175
1988	22,287	39,806	28,636	11,170	203,694
1989	23,853	42,440	30,218	12,222	222,281
1990	25,529	45,225	31,888	13,337	241,977
1991	27,119	48,168	33,649	14,519	263,026
1992	28,807	51,290	35,508	15,782	285,509
1993	30,601	54,601	37,470	17,131	309,509
1994	32,506	58,111	39,540	18,571	335,114
1995	34,530	61,832	41,725	20,107	362,416
1996	36,524	65,686	43,941	21,745	391,578
1997	38,632	69,769	46,274	23,495	422,715
1998	40,863	74,095	48,732	25,363	455,947
1999	43,222	78,677	51,320	27,357	491,402
2000	45,717	83,530	54,046	29,484	529,215

Source: Author's estimates. See Text.

Table 23

BENEFITS, RECEIPTS AND ASSETS OF MILITARY RETIREMENT SYSTEMS
WITH FULL FUNDING, FISCAL YEARS 1975-2000
(millions of dollars)

Year	Benefits	Receipts		Earnings on Investment	Assets
		Total	Contributions		
1975	$ 6,149	$ 6,149	$ 6,149	$ 0	$ 0
1976	6,708	13,159	13,159	0	6,451
1977	7,317	14,167	13,780	387	13,301
1978	7,982	15,227	14,429	798	20,546
1979	8,708	16,342	15,109	1,233	28,180
1980	9,499	17,512	15,821	1,691	36,193
1981	10,196	18,784	16,612	2,172	44,781
1982	10,944	20,129	17,442	2,687	53,966
1983	11,747	21,552	18,314	3,238	63,771
1984	12,609	23,056	19,230	3,826	74,218
1985	13,534	24,645	20,192	4,453	85,329
1986	14,396	26,322	21,202	5,120	97,255
1987	15,314	28,097	22,262	5,835	110,038
1988	16,289	29,977	23,375	6,602	123,726
1989	17,327	31,968	24,544	7,424	138,367
1990	18,431	34,072	25,770	8,302	154,008
1991	19,501	36,299	27,059	9,240	170,806
1992	20,633	38,660	28,412	10,248	188,833
1993	21,831	41,163	29,833	11,330	208,165
1994	23,099	43,814	31,324	12,490	228,880
1995	24,440	46,623	32,890	13,733	251,063
1996	25,669	49,599	34,535	15,064	274,992
1997	26,959	52,761	36,261	16,500	300,794
1998	28,314	56,123	38,075	18,048	328,603
2000	31,232	61,693	41,977	19,716	359,064

Source: Author's estimates. See Text.

Table 24

ASSETS OF STATE-LOCAL, CIVIL SERVICE AND MILITARY RETIREMENT SYSTEMS UNDER CURRENT FINANCIAL ARRANGEMENTS AND UNDER FULL FUNDING, SELECTED FISCAL YEARS, 1975-2000

	1975	1980	1985	1990	1995	2000
			(billions of dollars)			
State-Local						
Base Line	$ 98.1	$169.0	$261.1	$ 364.6	$ 458.4	$ 481.1
Funded	98.1[a]	257.9	499.3	845.9	1,323.0	1,932.7
Civil Service						
Base Line	38.4	69.3	115.0	174.2	254.3	368.7
Funded	38.4[a]	88.4	154.2	242.0	362.4	529.2
Military						
Base Line	0	0	0	0	0	0
Funded	0	36.2	85.3	154.0	251.1	359.1
Total						
Base Line	136.5	238.3	376.1	538.8	712.7	849.8
Funded	136.5[a]	382.5	738.8	1,241.9	1,936.5	2,821.0
Increase	0	144.2	362.7	703.1	1,223.8	1,971.2

[a]Funding is assumed to begin in 1976.

Source: Tables 14-16 and 21-23.

Table 25

CONTRIBUTIONS TO STATE-LOCAL, CIVIL SERVICE AND MILITARY RETIREMENT SYSTEMS UNDER CURRENT FINANCIAL ARRANGEMENTS AND UNDER FULL FUNDING, SELECTED FISCAL YEARS, 1975-2000

	1975	1980	1985	1990	1995	2000
			(billions of dollars)			
State-Local						
Base Line	$ 13.6	$ 22.2	$ 33.7	$ 50.8	$ 76.5	$ 113.6
Funded	13.6[a]	39.8	57.6	83.6	120.7	172.2
Civil Service						
Base Line	9.2	16.0	21.8	29.0	38.6	51.5
Funded	9.2[a]	18.2	24.4	31.9	41.7	54.0
Military						
Base Line	6.1	9.5	13.5	18.4	24.4	31.2
Funded	6.1[a]	15.8	20.2	25.8	32.9	42.0
Total						
Base Line	28.9	47.7	69.0	98.2	139.5	196.3
Funded	28.9[a]	73.8	102.2	141.3	195.3	268.2
Increase	—	26.1	33.2	43.1	55.8	71.9
GNP[b]	1,452.3	1,989.8	2,726.2	3,735.1	5,117.4	7,011.3
DI[c]	1,031.5	1,412.8	1,935.6	2,651.9	3,633.3	4,978.0
Increase as Percent of						
GNP	—	1.3	1.2	1.2	1.1	1.0
DI	—	1.8	1.7	1.6	1.5	1.4

[a]Funding is assumed to begin in 1976.

[b]GNP is assumed to grow at 6.5 percent — 3 percent inflation, 2 percent productivity and 1.5 percent labor force growth.

[c]Disposable income is assumed to be a constant (.71) proportion of GNP.

funding projections were then compared with the projections based on current financial arrangements (Tables 14-16) to determine the impact of funding on annual contributions and net assets.

Table 24 summarizes the asset accumulation of the system under the present financing and full funding. Table 25 presents the annual contributions for selected years under the two financing schemes. The additional contributions to fully fund these retirement systems would amount to approximately 1.2 percent of GNP or 1.6 percent of disposable income.

IV. Conclusions

Of the three methods employed to derive the unfunded liability and normal cost for the state-local, civil service and military retirement systems, only the quasi-actuarial analysis produced consistently reasonable results. On the basis of these results, the benefits, contributions, and interest income for a fully funded system were projected to the year 2000.

The projections indicate that if the state-local systems, the military and civil service were to change their current financing plans to full funding, there would be a substantial increase in contributions and accumulation of assets. The greatest proportional increase in contributions would occur in the state-local systems; a smaller percentage increase would be required for funding the military program, and civil service contributions would have to increase only slightly. The relative required increases reflect the differences in the current financing plans of the three systems. The civil service system is in transition to a financing scheme close to full funding and, therefore, the baseline projections reflect a rapid increase in the contribution rate between 1975 and 1980 and a high contribution rate thereafter. With these rates, civil service more than meets benefit payments in each year and can use the surplus revenues for asset accumulation. In short, since civil service is the closest of the three systems to full funding, the required additional contributions are the smallest.

Paradoxically, it is not true that the partially funded state-local systems require a proportionally smaller increase in contributions than the military plan which is financed completely on a pay-as-you-go basis. This paradox can be explained by the nature of the two systems. The state-local systems are relatively immature and therefore the ratio of beneficiaries to workers is presently quite low. This low ratio means that a low contribution rate yields sufficient revenues for benefit payments as well as some accumulation of assets. However, the ratio of beneficiaries to workers will rise significantly in coming years due to a tapering of the rapid growth in state-local employment experienced during the sixties. The full impact of the increasing rate however was not reflected in the baseline contribution rates since interest income and accumulated assets were assumed to meet a portion of the benefit payments after 1990. Therefore,

the contribution rates incorporated in the baseline projection are significantly below the normal cost rate (in 1975 11.8 percent versus 16.4 percent) and a substantial increase in contributions is required to cover normal costs as well as to amortize the existing liability. In contrast, the more mature military retirement system has already experienced a rapid increase in the beneficiary-worker ratio and has a significantly higher ratio which requires a large percent of payroll simply to meet annual benefit payments. Therefore, the scheduled tax rates under the military are high relative to the normal costs of the program. In short, although the state-local systems are closer to full funding than the military, the increase in contributions for the military is less relative to the high rates required to finance annual benefits.

The net impact on asset accumulation from funding the three systems will depend on the source of the increased contributions. For the civil service and state-local systems, the additional contributions would probably come from the appropriate government which in turn would be derived from higher taxes — most probably higher personal taxes.[20] The impact on total saving will depend on whether the taxes come from income that would have been used for consumption or from income that would have been saved. The most reasonable assumption is that increased taxes to fund a pension system are very similar to increased taxes to finance any other government expenditure and therefore the reduction in disposable income would come partly from saving and partly from consumption. Since the fraction of disposable income saved is relatively small (less than 10 percent), most of the increased revenues for funding would come from consumption and represent a net increase in saving.

For the military, a portion of the increased receipts would probably be financed by some contribution from employees and the remainder through tax revenues. Since there would be no change in benefits, the increased contributions from employees would most likely be viewed simply as a reduction in disposable income and therefore would come mostly from consumption. Assuming the increased government contributions

[20]To really fund the retirement programs, it is essential that total government taxes be increased or expenditures reduced by the amount required for the funding payment; otherwise, the funding scheme will involve nothing more than a paper transaction (at the Federal level) between the Treasury and the Civil Service or Military Retirement Fund. For instance, if an annual contribution of $10 billion were required to fund civil service, the CSR account could be credited every year with $10 billion and the Treasury account debited for the same amount. This intragovernmental transfer would not show up in the budget which is completely appropriate since no accumulation of government funds has occurred. After 40 years, the CSR fund would appear to have accumulated $400 billion. Assume a decision is made at that time to pay off all accrued benefits. An expenditure of $400 billion would appear in the budget which would then have to be financed either by increased taxes or increased debt since no government fund had actually been accumulated (CSR assets are offset by Treasury liabilities). In other words, it is not sufficient to run a surplus in the CSR account; funding requires a larger surplus or smaller deficit in the total Federal budget.

were derived primarily from personal taxes, these revenues would also come mainly from consumption. As in the case of civil service and state-local systems, the increased contributions to fund the military system will serve to increase aggregate saving.

Some caveats are required for the results presented above. First, any estimate of unfunded liability is extremely sensitive to the ratio of assumed growth in wages to the rate of interest. This analysis has been based upon a 6 percent interest rate and 5 percent wage growth; other combinations of rates might be applied. Second, the impact of funding was measured against a baseline projection which incorporates many judgmental factors and therefore the baseline itself may not be correct. Finally, since all the models are sensitive to the assumed replacement rates, retirement ages and rate of contributor and beneficiary growth, other researchers might derive different estimates.

Nevertheless, the conclusion that funding the state-local, military and civil service retirement system would significantly increase the rate of savings seems inescapable.

Appendix Table A-1

DATA FOR BASELINE PROJECTIONS

STATE-LOCAL

I. Contributions	Employment (thousands)	Annual Payroll (millions)	Average Earnings	Total Contributions (millions)	Contributions as Percent of Payrolls
1950	4,285	$ 10,980	$ 2,562	N.A.	N.A.
1952	4,522	13,484	2,982	$ 737	5.5
1955	5,054	17,026	3,369	N.A.	N.A.
1960	6,387	26,580	4,162	2,792	10.5
1965	8,001	40,804	5,100	4,044	9.9
1970	10,147	70,877	6,985	7,388	10.4
1971	10,444	76,586	7,333	8,400	11.0
1972	10,964	86,880	8,039	8,850	10.2
1973	11,352	96,179	8,472	10,815	11.2
1974	11,794	105,988	8,975	12,027	11.3
1975	12,097	115,907	9,581	13,604	11.8
1980	13,985	171,009	12,228	22,164	12.9
1985	15,913	247,589	15,606	33,673	13.6
1990	18,030	359,122	19,918	50,843	14.2
1995	20,396	518,487	25,421	76,507	14.8
2000	22,801	739,756	32,444	113,584	15.4

II. Benefits	Beneficiaries (thousands)	Total Benefit (millions)	Average Benefit	Ratio of Average Benefit to Average Earnings
1950	294	$ 320	$ 1,088	.42
1952	N.A.	530	N.A.	N.A.
1955	427	722	1,691	.50
1960	660	1,265	1,917	.46
1965	886	2,008	2,266	.44
1970	1,291	3,638	2,816	.40
1971	1,379	4,155	3,013	.41
1972	1,463	4,768	3,259	.41
1973	1,550	5,812	3,750	.44
1974	1,635	6,639	4,061	.45
1975	1,730	7,490	4,329	.45
1980	2,346	15,204	6,481	.53
1985	3,154	28,549	9,052	.58
1990	4,241	50,684	11,951	.60
1995	5,702	86,971	15,253	.60
2000	7,667	149,251	19,467	.60

Appendix Table A-1 (Cont'd)

DATA FOR BASELINE PROJECTIONS

MILITARY

I. Contributions[a]

	Employment (thousands)	Annual Payroll[b] (millions)	Average Earnings	Total Contributions (millions)	Contributions as Percent of Payrolls
1950	1,451	$ 2,869	$ 1,977	$ 331	11.5
1955	2,923	6,821	2,334	442	6.5
1960	2,466	6,207	2,517	693	11.2
1965	2,644	7,702	2,913	1,386	18.0
1970	3,053	13,809	4,523	2,853	20.7
1971	2,701	13,718	5,079	3,389	24.7
1972	2,311	14,230	6,158	3,889	27.3
1973	2,242	14,758	6,583	4,392	29.8
1974	2,152	15,116	7,024	5,137	34.0
1975	2,117	15,497	7,320	6,239	40.3
1980	2,088	19,508	9,342	9,499	48.7
1985	2,088	24,898	11,923	13,534	54.4
1990	2,088	31,776	15,217	18,431	58.0
1995	2,088	40,555	19,421	24,440	60.3
2000	2,088	51,760	24,787	31,232	60.3

II. Benefits

	Beneficiaries (thousands)	Total Benefit (millions)	Average Benefit	Ratio of Average Benefit to Average Earnings
1952	138	$ 331	$ 2,399	N.A.
1955	174	442	2,540	1.09
1960	243	693	2,852	1.13
1965	462	1,386	3,000	1.03
1970	750	2,853	3,804	.84
1971	806	3,389	4,205	.83
1972	867	3,889	4,486	.73
1973	924	4,392	4,753	.72
1974	984	5,137	5,221	.74
1975	1,050	6,239	5,942	.81
1980	1,271	9,499	7,474	.80
1985	1,419	13,534	9,538	.80
1990	1,514	18,431	12,174	.80
1995	1,573	24,440	15,537	.80
2000	1,575	31,232	19,830	.80

[a]Contributions were simply set equal to benefit payments; the following data are presented merely to show the implications as a percent of payroll of this type of financing.

[b]Basic pay only.

Appendix Table A-1 (Cont'd)

DATA FOR BASELINE PROJECTIONS

CIVIL SERVICE

I. Contributions	Employment (thousands)	Annual Payroll (millions)	Average Earnings	Total Contributions (millions)	Contributions as Percent of Payrolls[a]
1950	2,117	$ 7,361	$ 3,477	$ 661	9.0
1955	2,378	10,148	4,268	473[b]	4.7
1960	2,421	13,414	5,541	1,509	11.2
1965	2,588	17,804	6,880	2,182	12.3
1970	2,881	29,135	10,113	3,692	12.7[c]
1971	2,872	30,344	10,566	4,583	15.1[c]
1972	2,795	32,515	11,633	5,279	16.2[c]
1973	2,786	36,144	12,973	6,042	16.7[c]
1974	2,874	39,532	13,755	7,150	18.1[c]
1975	2,890	43,006	14,881	9,241	21.5[c]
1980	2,978	56,558	18,992	15,989	28.3[c]
1985	3,130	75,871	24,240	21,805	28.7
1990	3,209	99,277	30,937	29,008	29.2
1995	3,290	129,902	39,484	38,568	29.7
2000	3,339	168,262	50,393	51,539	30.6

II. Benefits	Beneficiaries (thousands)	Total Benefit (millions)	Average Benefit	Ratio Average Benefit to Average Earnings
1950	172	$ 266	$ 1,547	.44
1955	297	428	1,441	.34
1960	515	893	1,734	.31
1965	729	1,438	1,973	.29
1970	959	2,752	2,867	.28
1971	1,027	3,231	3,145	.28
1972	1,091	3,748	3,435	.30
1973	1,193	4,588	3,846	.30
1974	1,307	5,785	4,426	.32
1975	1,372	7,207	5,253	.35
1980	1,673	11,756	7,027	.37
1985	1,923	18,179	9,454	.39
1990	2,063	25,529	12,375	.40
1995	2,133	34,530	16,188	.41
2000	2,160	45,717	21,165	.42

[a]Based on Census fiscal year payroll rather than civil service payroll data used in Table 11 of text.
[b]Congress failed to make full appropriations in 1955.
[c]1970-1980 is a period of transition to fuller funding.

Appendix Table A-2

PROJECTION OF STATE-LOCAL EMPLOYMENT, 1975-2000
(thousands)

	Population		State-Local Employment			
			Education		Noneducation		Total
	Age 5-24	Age 25 and Over	Number of Employees	Ratio to Population Age 5-24	Number of Employees	Ratio to Population Age 25 and Over	
Actual							
1950	46,942	88,919	1,723	.037	2,562	.029	4,285
1955	52,140	95,227	2,169	.042	2,886	.030	5,055
1960	60,312	100,018	2,918	.048	3,469	.035	6,387
1965	70,200	104,279	3,960	.056	4,041	.039	8,001
1970	77,221	110,494	5,297	.069	4,850	.044	10,147
1971	78,161	111,709	5,481	.070	4,963	.044	10,444
1972	77,913	113,922	5,626	.072	5,183	.045	10,809
1973	77,866	115,825	5,901	.076	5,451	.047	11,352
1974	77,868	117,736	6,202	.080	5,592	.047	11,794
Projection							
1975	77,961	119,579	6,393	.082	5,740	.048	12,133
1980	75,440	130,069	7,091	.094	6,894	.053	13,985
1985	72,602	141,680	7,696	.106	8,217	.058	15,913
1990	72,746	152,232	8,439	.116	9,591	.063	18,030
1995	75,757	159,576	9,545	.126	10,851	.068	20,396
2000	79,043	165,088	10,750	.136	12,051	.073	22,801

Source: U.S. Bureau of the Census, *Current Population Reports,* Series P-25, No. 601 (October 1975) and No. 519 (June 1974); U.S. Bureau of the Census, *Public Employment,* CE75, No. 1 and earlier issues.

Appendix Table A-3

ESTIMATES OF BENEFICIARIES AND CONTRIBUTORS 1975-2000
USED IN CALCULATION OF UNFUNDED LIABILITY
BY TREND EXTRAPOLATION METHOD

STATE-LOCAL

	Beneficiaries	Contributors
1975	1,745	12,097
1980	2,680	7,258
1985	3,119	4,355
1990	3,157	2,613
1995	2,885	1,568
2000	2,399	941
2005	1,788	564
2010	1,150	339
2015	575	0
2020	160	0
2025	0	0

CIVIL SERVICE

	Beneficiaries	Contributors
1975	1,372	2,890
1980	1,604	1,734
1985	1,702	1,040
1990	1,681	624
1995	1,565	373
2000	1,380	225
2005	1,125	135
2010	841	81
2015	541	0
2020	245	0
2025	0	0

MILITARY

	Beneficiaries	Contributors
1975	1,050	2,117
1980	1,317	1,164
1985	1,490	640
1990	1,574	352
1995	1,573	194
2000	1,491	107
2005	1,331	0
2010	1,098	0
2015	795	0
2020	428	0
2025	0	0

Source: Authors' estimates.

SOURCES: Appendix A-1

STATE-LOCAL

I. Contributions

Employment and Payrolls from Bureau of the Census 1950-1972 *1972 Census of Governments, Public Employment* (Vol. 3 No. 2), p. 13. 1973-1975 from *Public Employment* 1973, 1974, 1975. 1980-2000, Authors' estimates. Contributions 1950-1975, *Finances of Employee Retirement Systems of State & Local Governments* 1960, 1961, 1963-64, 1964-65, 1965-66, 1967-68, 1968-69, 1970-71, 1972-73, 1973-74, 1974-75, Table 2 and in 1960, p. 3.

II. Beneficiaries

Beneficiaries: 1950-1974, Social Security Administration, *Social Security Bulletin, Annual Statistical Supplement* 1974, p. 47, 1975 figure from 1975 Research and Statistics Note No. 17 (August 20, 1976) p. 4, 1980-2000, Authors' estimates; Total Benefits: 1950-1975 Bureau of the Census, *Finances of Employee Retirement Systems of State and Local Governments* 1960, 1961, 1963-64, 1964-65, 1965-66, 1967-68, 1968-69, 1970-71, 1972-73, 1973-74, 1974-75. 1980-2000, Authors' estimates.

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Discussion

James M. Stone*

The paper presented by Munnell and Connolly lends strength to the contention that nonfunding or underfunding of pension liabilities depresses private savings. More importantly, it seeks to estimate the extent of the underfunding in a particularly significant pension area: the governmental plans established for state, local, civil service and military employees. My comments on Munnell and Connolly's estimating methods will be brief. I would like to devote most of my time today to a more general line of thought on a closely related subject.

Three estimating methods were used in this paper to quantify the unfunded liabilities of the pension plans considered. That only one of the three produced consistently sensible results should come as no surprise.

Any attempt to measure unfunded liabilities requires knowledge about the age distribution of both the working and retired participants in the system. The first two approaches tried by Munnell and Connolly assume stability in the age distributions, an attribute not present in plans covering rapidly changing work forces. Only the third method, called the quasi-actuarial method by the authors, does not make that assumption. My only criticism of the Munnell-Connolly paper is that it takes the reader through too much empirical material employing the two doomed methods. They should have been dismissed on logical grounds rather than used and then dismissed for their unsatisfactory results.

The quasi-actuarial method is a good one. While the authors correctly note that its treatment of the age distribution issue could be improved with more complete data, I frankly doubt that further precision is worthwhile. Given massive uncertainties about future benefit adjustments and work force changes, it is of questionable value to seek a high degree of exactitude in liability measurement. I can accept the Munnell-Connolly estimates of unfunded liabilities as the best available and the best that need be generated for any practical purpose.

My stronger interest lies with a related subject which lurks between the lines of this paper. I am firmly convinced that the issues surrounding control of pension fund assets are destined to generate one of the major

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economic policy debates of the next decade. Let us assume that we are about to see increasing participant pressure for the funding of public pension liabilities. Add to that pressure the power of the economists' lobby, which seems to be lending its support to the concept of funding for entirely different reasons. The result will most certainly be an increase in funding, at least at the state level. It is curious, therefore, that no one is yet asking how the money is going to be used. The question will not be an easy one to answer. Munnell and Connolly project that fully funded state and local pension funds would hold $2 trillion by the year 2000. That is an immense number for state and local governments to deal with. The unspoken assumption of all the economists here today seems to be investments of the funds will be essentially passive commitments to government obligations or traditional institutional choices in a diversified portfolio. Let me go on record as saying unambiguously that the assumption will prove false. It will be simply irresistible for state governments to influence the shape of capital formation. First may come an encouragement of mortgage investments, then perhaps a capital market break for domestic businesses. Anyone who doubts what I am saying should look at how easily the municipal crises of 1975 led to the conclusions that city and state pension funds should invest in their own securities. Last year my office had to issue an order preventing a Massachusetts municipality from overcommitting its assets in its own bonds.

There is a good economic argument for thinking that government intervention in the direction of investment assets might be a positive force when viewed in its most abstract terms. I spoke loosely when I described investments in bills or institutional market baskets of securities as passive investments. Neither is truly passive or neutral in economic impact. As soon as one acknowledges the institutional barriers to the social efficiency of all large fund investments, the concept of passivity becomes elusive. There are strong arguments that at least two such barriers exist. Certain economists have contended for many years that there is an inherent market bias in the United States which causes funds to be overcommitted to private purposes and undercommitted to public purposes. It is certainly not demonstrable that our society is allocating a proper share of its investment capital to such public goods as education, scientific research, transportation, or housing. If the returns to those investments are difficult for an investor to measure or capture, there is likely to be a distortion in our pattern of capital formation. A second bias results from the fact that large investment institutions are prone to confine their asset purchases to the largest issues of the largest issuers. This malady follows directly from the tight concentration of investable assets in the United States. A large private or public investor may well think it efficient to study only a small number of situations. Only the most substantial investment opportunities attract large investors' attention. Moreover, if they wish to remain fairly liquid, their opportunities are narrowed still further to large investment opportunities which are small fractions of even larger investment opportunities.

I am inclined to believe that both of the biases just described are real. Investments by government pension funds in Treasury bills or in traditional institutional market baskets will merely perpetuate the biases. It is for this reason that a truly passive investment strategy is hard to find. Commitments to the mix of public and private purposes in an investment portfolio and the mix of large and small issues should be viewed as conscious decisions. As the public role in controlling investment flow expands, so will the realization that this is the case.

My conclusions at this point are twofold. Firstly, the now theoretical debate over the social efficiency of private investment will become a heated practical debate as the accumulation of government pension assets grows. Until now, government involvement in capital formation could only have come through mandatory controls. Controls over private capital would be so difficult to bring about in the current political environment that their proponents have been paid little heed. But the balance of force quickly changes as we begin to fund government pension liabilities. When governments hold the funds, governments must make the investment decisions themselves. It is far easier for government to exert control over money in someone else's possession.

Secondly, I would point out that the issue of pension fund investment policy forms the tip of the iceberg of a still larger issue. One can not address the control of public pension funds without simultaneously touching on the issue of central planning. Government control of billions of investment dollars is central planning. Should the Social Security system, with liabilities in the trillions of dollars, ever be funded it could exert a near monopoly on capital formation planning. It is simply unrealistic to talk of pension liability funding without talking about it in these terms.

Should the pressures for funding continue to grow, public pension systems will provide the catalyst for the paramount economic debate of the next decade. To whatever extent this conference leads to the cementing of an economists' lobby in support of funding, it is simultaneously foreordaining the convening of a future conference on the investment of the funded assets. The magnitude of the issue is almost universally underestimated.

Private Pensions: The Impact of ERISA on the Growth of Retirement Funds

Randall D. Weiss*

The Employee Retirement Income Security Act of 1974 (ERISA) has brought enormous changes to the environment within which pension plans are created and operated. The new law attempts to reduce the uncertainty which workers face in assessing the value of their pension plans. By regulating the vesting and participation requirements with which pensions may be offered to workers, ERISA guarantees workers who meet specified minimum age and seniority requirements, and whose employers have pension plans, that they will definitely be able to receive a pension if they survive until the plan's early retirement age. (The law does not mandate a minimum pension benefit, however, nor does it require firms which lack a pension plan to establish one.) To guarantee the security of vested benefits, pension fund trustees are required to act prudently and to diversify their investments, and firms must pay premiums to a new federally chartered corporation which insures the unfunded liabilities of defined benefit pension plans. Finally, changes in tax laws have made available to workers not covered under employers' pension plans the tax advantages of qualified plans.

This paper assesses the implications of this new pension environment for the growth of pension funds, and concludes that the effect of ERISA will be small. Thus, any pre-ERISA projections of pension fund growth need not be revised solely because of the new law.

The first part of the paper discusses in general terms the economic considerations which lead to the establishment of pension plans by employers and the features of the different types of plans. The second section reviews ERISA's provisions and how they change the costs of providing pensions and the relative costs of plan types, and, thus, the incentives which vitally affect the rate of accumulation of reserves in pension funds. Part III summarizes the arguments about the impact of ERISA on future pension fund growth.

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I. Basic Economics of Pension Plans

A. *Incentives for Employer Provision of Retirement Income*

Why is it that workers seek to have their retirement income provided by employer-sponsored pension plans rather than accumulating their own resources from their wages? There are at least three important reasons: tax advantages, efficiencies of group administration of annuities, and firms' greater ability to achieve a high rate of return on savings.

For many years, substantial tax advantages have been granted to pension and profit-sharing plans "qualified" by the Internal Revenue Service, and almost all existing plans are qualified. As long as the plans meet certain stipulations, firms can deduct their contributions to the plans, workers can defer paying taxes on these employer contributions until they are received as retirement benefits, and pension fund earnings are exempt from taxes.

Until ERISA allowed workers to establish Individual Retirement Accounts, no such advantage was available to the employee whose employer did not have a pension plan. (The implications of IRAs will be discussed below.) Thus, workers who wanted a private source of retirement income were motivated to find an employer who had a pension plan, even if that employer offered lower wages. And, as the average worker's marginal tax rate has increased in the last 30 years, this tax advantage has become progressively more important, with the increase undoubtedly adding to the pressure for employer-sponsored pension plans. The proportion of the private wage and salary labor force covered by pension or deferred profit-sharing plans grew from 22 percent in 1950 to 45 percent in 1974.[1]

Group efficiencies in the administration of annuities also help to explain why it makes economic sense for employees to seek out employer-provided pension plans. In the absence of such plans, most retired people would probably want to convert a portion of their assets into annuities, but since they would have to do this on an individual basis, they would undoubtedly be forced to pay high, individual rates to insurance companies. However, when a pension plan provides the annuities, the plan can either obtain lower group rates or the plan, itself, can administer the annuities, especially if it is large enough so that its members' mortality experience can be accurately predicted.

The third important basis for the provision of pension plans by employers is the fact that employers can, in many cases, obtain a higher rate of return on their pension funds than the average worker can. Because of the fund's ability to pool investment risks, it can earn a higher rate of return than can the average worker.

As we will see below, ERISA has reduced the advantage for employer provision of pension plans by reducing their cost advantage in all three areas.

[1]Alfred M. Skolnik, "Private Pension Plans, 1950-74," *Social Security Bulletin,* June 1976, pp. 3-17.

B. *Types of Pension Plans*

In order to analyze the effects of ERISA on retirement plans, we must first distinguish between defined benefit and defined contribution plans (the two main types offered) since some sections of the new law apply only to defined benefit plans.

(1) Defined benefit plans

Defined benefit plans promise workers a specified amount of retirement benefits generally based on their years of service and earnings. In recent years it has become increasingly common to use final, rather than career average, earnings in the determination of benefits. (Use of the average of the last five years' earnings is now the most common base in formulas which contain earnings).[2] This trend has increased employees' protection against inflation, since they can predict with near certainty the ratio of their immediate pre-retirement earnings to their retirement benefit. Even when the benefit formula does not explicitly contain earnings, there is a tendency for periodic upgrading, especially in collective bargaining situations. Of course, the inflation protection for workers is at the expense of the firm. Unexpected inflation (which is not reflected in the nominal yields available to the fund's investment managers) can sharply increase a firm's pension liabilities, since final pay is multiplied by *all* years of service in determining retirement benefits.

Because of the pension plan's commitment to pay each worker a readily defined benefit, these plans typically give rise to unfunded liabilities. For example, when a defined benefit plan is established, at least several years of workers' service prior to this initiation are almost always included when the benefit is computed. Creation of "past service liability" is hardly ever accompanied by a corresponding lump-sum payment into the pension fund, so that the plan begins with expected liabilities greater than its assets. Unfunded liabilities are also created when pension plans are amended, since the changes are almost always retroactive.

If a pension plan is tax-qualified, its establishment and amendment are the only circumstances under which its managers are allowed to create unfunded liabilities. Even under pre-ERISA Internal Revenue regulations, plans not amended always had to receive employer payments sufficient to insure that unfunded liability always remained below the sum of those created from the initiation and amendment of the plan.

Thus firms desiring to put as little money as possible into the fund had to pay currently accruing liabilities ("normal cost") plus interest on unfunded liabilities into the pension fund each year. Still, firms had considerable flexibility in making their payments into the pension fund, since

[2]Harry E. Davis and Arnold Strasser, "Private Pension Plans, 1960-1969 — an Overview," *Monthly Labor Review*, July 1970, pp. 45-56.

they could go for several years without payments if previous payments had been greater than the minimum. The maximum amount deductible in any year was normal cost plus one-tenth of unfunded liability, so there was considerable spread between the minimum and maximum. It was quite common for firms to make high payments into the fund in years of unusually good profits and no payments in unprofitable years.

Interestingly, a large number of pension funds did not take advantage of the entire tax deduction allowed them; this behavior has two principal explanations. First, firms may have decided that the after-tax return on assets retained in the business was higher than the (tax-free) return of the pension fund. Second, firms may have believed that their plans would be terminated before the liabilities were funded. Before ERISA, none of a pension plan's unfunded liability was the company's liability. Almost all pension plans contained a provision allowing the company to terminate the plan under any conditions; in fact, business difficulty and merger were the two most common causes. When terminated plans had unfunded liabilities, at least some workers did not receive all the benefits they had been led to expect. A company which anticipated termination of its plan would be understandably reluctant to put more than the minimum required payment into the pension fund.

(2) Defined Contribution Plans

The other major category of plans is the defined contribution plan, under which the firm places a specific number of dollars (usually related to a worker's salary) into a pension account. The funds are used to purchase annuities from an insurance company or are simply pooled in an investment fund, the worker's share of which is converted into an annuity at retirement. In this arrangement, the worker's benefit is determined by the amount contributed and by performance of the fund, not by any explicit relationship with final pay. Workers, not firms, bear the risk of unexpected inflation, which can lower the ratio of their retirement benefit to their pre-retirement salary. Furthermore, firms do not have any unfunded liability, since their entire liability under the plan is discharged each year by making a specific payment into the pension fund.

Most defined contribution plans are deferred profit-sharing plans, under which the company's annual contribution to the fund depends on profits in each year. Each worker's share of the firm's total contribution depends on a fixed formula, which usually contains years of service and wage level. The flexibility of the annual cost of profit-sharing plans makes them much more popular with employers than "money-purchase" plans, under which the defined contribution to each worker's account is independent of profits.

II. The Provisions of ERISA

ERISA changes the pension environment in five areas: (1) by imposing requirements on the provisions of pension plans, such as the rules

for vesting and participation, (2) by requiring firms to gradually eliminate unfunded liabilities over a specified period, (3) by requiring firms with defined benefit plans to participate in a plan to insure workers against the loss of unfunded liabilities if the plan should terminate, (4) by imposing standards on the conduct of the fiduciaries who control the pension fund, including limitations on the investments in which these funds can partake, and (5) by lowering the tax incentive for the creation and growth of employer-sponsored pension plans by allowing workers to establish Individual Retirement Accounts.

This section discusses the principal changes which ERISA effects and its likely influence on the development of pension funds. It should be emphasized that this survey of ERISA is by no means comprehensive. Many details of the law (such as the imposition of a maximum retirement benefit for qualified plans) affect only a small number of individuals, are likely to have a negligible impact on the growth of pension funds, and therefore have not been considered.

A. *Vesting and Participation Requirements*

ERISA imposes detailed regulations on eligibility requirements and vesting conditions for all private pension plans. Firms must comply with one of three vesting options; together, these options imply that all workers will be at least 50 percent vested after ten years or less and 100 percent vested after 15 years or less. Many of the largest plans had already instituted vesting conditions at least as liberal as those mandated by ERISA, but many others have been forced to rewrite their plans to give irrevocable pension rights to short-service workers who previously would have obtained nothing from the company's plan if they had left the company. In addition, the new law mandates that workers be given credited service for any years in which they work at least 1000 hours and that under certain conditions breaks in service not result in the forfeit of previously accumulated credits. For the purposes of computing benefits, ERISA dictates that the formula count all service after age 25, except the first year, (or the first three years if full and immediate vesting is offered). Thus, many workers who may have obtained nothing under their companies' pre-ERISA plans will receive at least small benefits, and many others will see their benefits increase.

How will these rules affect the total funds going into pension plans? Hardly at all, according to traditional labor market perspectives, which imply that the size of total compensation is determined independently of its division into wages and fringe benefits.

The basis of these perspectives deserves a short explanation. Suppose the labor market were perfectly competitive, so that each employer could pay no less than what the market indicated without losing all his employees. Further assume that because of the factors discussed in Section I, employers can save more efficiently than workers, that $1 spent by employers ultimately provides more resources to the retiring worker than $1 saved

by the workers themselves. Assuming that individual workers desire to save something for their retirement, employers will soon discover that by putting some of their personnel budget into pension plans, they outbid any firm which offers all compensation as wages, since workers will value at least some of the dollars put into the pension more than the same money put into wages. The right mix of pensions and wages depends on the consumption-saving preferences of each employer's labor force; we would expect to observe a variety of combinations, corresponding to the variety of preferences workers might have. As part of this equilibrium, however, there is one important condition — that all employers spend the same amount on total compensation. If this were not true, then the high-paying employers, seeking to keep their labor costs to a minimum, would simply imitate the compensation arrangements of their competitors. As a result, any employers who offered higher than average pension benefits would offer lower than average wages, and, again, each employer would pay the same rate of total compensation to workers of given quality.

This logic seems convincing for a perfectly competitive labor market, but, of course, the real world is not perfectly competitive. Numerous statistical studies have confirmed that some employers pay more than others to given quality workers. Many of these differences, however, appear to be associated with well-defined institutional features of labor markets, such as the presence and strength of labor unions, the size of the establishment, and the location of employment. To the extent that these factors influence wages, however, they should influence other aspects of compensation. Thus two unions of equal strength should be able to secure the same total compensation, other things being equal. If one union decides to seek larger pensions than the other, then it should be forced to give up some wages or other benefits. Often this situation is made explicit in collective bargaining situations, in which negotiators first bargain for increases in total compensation and then for the division of that increase among the various forms of compensation. Thus, even when we recognize the existence of noncompetitive forces in the labor market, it still seems reasonable that, holding worker quality and institutional influences constant, firms which have more liberal pension plans should be observed to have lower wage rates.

ERISA changes neither worker quality nor the institutional influences which allow unionized workers or those in certain industries to receive more in total compensation than equal quality workers in lower-wage or nonunionized firms. Thus, the arguments above imply that ERISA should not change any workers' rate of total compensation. Any increases in pension benefit costs due to the prescribed vesting and credited service provisions in ERISA should cause reductions in either pension benefits or wages relative to what they would have been in the absence of the law.

The few empirical studies relevant to this question indicate that this theoretical viewpoint is not inconsistent with reality. In a paper I wrote with Schiller, data on the wages and pensions of a sample of workers in

33 firms suggest that, other things being equal, workers in firms with relatively good pensions receive relatively low wages. Other research suggests that workers who are exposed to low risk of injury, who receive high fringe benefits and who are satisfied with their jobs receive relatively low wages, holding constant all other influences.[3]

The proportion of this increased cost which will be met by reductions in pension benefits rather than reductions in wages will probably be quite high. Firms which had stringent or no vesting provisions before ERISA implicitly allocated very little of their pension budgets to their least senior workers, many of whom were probably quite satisfied to receive almost all of their compensation as wages. ERISA will now force these firms to give these workers irrevocable rights to pension benefits in which they will place very little value. The firms will therefore be under considerable pressure to maintain their wage levels, and the above arguments imply that they will accomplish this by reducing pension benefits relative to what they would have been in the absence of the law. At first, this may upset the workers who retire from the firm but eventually, many of them will have accumulated vested pension benefits from their previous employers and will not demand as high a benefit from their last one.

Even if the above arguments were entirely incorrect, the increase in overall pension costs resulting from ERISA's vesting provisions would probably be quite small. It has been estimated that perhaps as much as 20 percent of the total reserves of private insured and noninsured retirement plans belong to profit-sharing plans. Because of previous IRS rulings, almost all of these already conformed with ERISA's dictates. A study by the Bureau of Labor Statistics estimated that in 1969, the plans of 26 percent of the workers covered under pension plans (as opposed to profit-sharing plans) provided for vesting in ten years or less with no age requirement.[4] If we assume that this figure is a good estimate of the proportion of pension assets not affected by ERISA, we conclude that 41 percent [20% + (.26 x 80%)] of all funds belonged to plans totally unaffected by the new vesting provisions. The cost increases for the remainder depend on the plan population's turnover rates, the pre-ERISA vesting provisions and the other provisions of the plan. Two congressionally sponsored studies compute, under a variety of assumptions, the increased costs resulting from ERISA's provisions.[5] My very subjective combination of these computations and the BLS data on existing

[3]Randall D. Weiss and Bradley R. Schiller, "The Value of Defined Benefit Pension Plans: A Test of the Equalizing Differences Hypothesis," 1976; Richard Thaler and Sherwin Rosen, "The Value of Saving a Life: Evidence from the Labor Market," 1973; Charles Brown, "Equalizing Differences in the Labor Market," 1975.

[4]Davis and Strasser, *op. cit.*

[5]Donald S. Grubbs, Jr., *Study of the Cost of Mandatory Vesting Provisions Proposed for Private Pension Plans,* Subcommittee on Labor, Senate Committee on Labor and Public Welfare, 1973; Howard E. Winklevoss, *Estimates of the Cost of Vesting in Pension Plans,* Subcommittee on Labor, House Committee on Education and Labor, 1973.

vesting provisions yield a guess of an average 5 percent cost increase for the 63 percent of funds less liberal than ERISA. These figures imply a 3 percent increase in the level of contributions to pension funds, which is rather small in relation to the 15.6 percent average annual growth in contributions during 1970 to 1974.

In summary, the vesting standards will cause very little future increase in pension costs. First, theoretical arguments imply that the workers who did not want vested pensions as soon as provided under the ERISA options will not accept the new, vested pension rights as a perfect substitute for wages. But since the sum of pension and wage costs will not rise, pension benefit levels will have to be reduced to allow these workers to come close to maintaining their previous wage levels. Second, even if this theory is completely incorrect, the vesting provisions of ERISA would increase pension costs very little. Similar considerations apply to the effect of the new participation standards, but with a much smaller possible impact.

B. *Funding Standards*

Before ERISA, tax-qualified defined benefit pension plans were subject to the requirement that unfunded liability could never go above the sum of the initial level, plus any amounts that were added when plans were liberalized. Thus, firms desiring to put as little as possible into their pension plans over a period of years would simply contribute the currently accruing liability (actuarially estimated "normal cost") plus interest on the unfunded liability (calculated using the interest rate assumed in the actuarial framework of the plan). Firms which had put in more than the minimum in previous years could skip contributions, just as long as total unfunded liability did not exceed the maximum permissible level. IRS regulations had little to say about recognition of differences between the assumptions about rate of return, mortality, turnover, and wage increases and the actual experience of the plan in these areas. Thus, for example, several decreasing years in the stock market would make it unlikely that a plan whose assets were heavily invested in common stock would achieve the return assumed in the actuary's calculation of unfunded liability and normal cost; since IRS allowed assets to be valued at cost, however, these circumstances did not require any change in the minimum contribution. Even when losses were recognized, they could simply be added to unfunded liabilities. Conversely, experience gains (such as actual return or actual mortality higher than assumed) could be recognized frequently and be credited in full, immediately, against the unfunded liability. In general, these rules allowed firms considerable leeway to adjust their contributions to the condition of their cash flow.

ERISA dictates a higher minimum contribution for plans which have an unfunded liability. The new minimum schedule of payments for plans which already existed when ERISA was enacted is the sum of normal cost and a level payment sufficient to amortize the unfunded liability over 40 years. Unfunded liabilities established either through plan initiation or

amendment after the effective date of ERISA will have to be amortized over either 30 years (single employer plans) or 40 years (multi-employer plans). Even more important is the change that ERISA mandates in the recognition of experience gains and losses. Gains and losses must be recognized at least every three years; losses must be amortized over no more than 15 years, while gains can be recognized no more quickly than in even credits over 15 years. (These periods are 20 years for multi-employer plans.) As before, plans which contribute more than the minimum in one year can contribute correspondingly less in future years.

Of these two changes — amortization of unfunded liability and recognition of experience gains and losses — the former will probably be much less significant. There is considerable evidence, mostly from the 1966 survey of Griffin and Trowbridge, that many pension plans were funding their unfunded liabilities at least as fast as ERISA now mandates.[6] These data do not even reflect the impetus provided by Opinion Number 8 of the Accounting Principles Board in 1966, which required that for the purposes of profit-and-loss statements, firms show as a cost that amount necessary to fund vested liabilities over a 40-year period. Although this did not require firms to actually make such outlays, it probably encouraged such a practice.

Thus a majority of workers in pension plans probably belong to plans whose funding practices will not be changed by ERISA. Even for the remainder of firms, however, these funding rules will not cause a large change in the minimum contribution, which consisted of two components — normal cost and interest on unfunded liability. For a typical employee group, the interest is likely to be about 50 to 60 percent of this minimum contribution.[7] But at a 6 percent interest rate, (this is the median rate used in a sample of large plans recently surveyed by Bankers Trust), the annual payment necessary to amortize the principal in 30 years is only 14 percent more than the interest payment alone.[8] The increases in the minimum contribution, therefore, would be about 8 percent for new liabilities and even less for old liabilities, which can be amortized over 40 years.

A rough estimate of the percentage of fund contributions affected by the new standards can be derived. Data on insured plans indicate that 38 percent of 1973 contributions into these plans went into deferred group annuities, individual policy pension trusts, HR 10 plans, and tax-sheltered

[6]Frank L. Griffin, Jr. and Charles L. Trowbridge, *Status of Funding Under Private Pension Plans* (Homewood, Ill.: Richard D. Irwin Co., 1969).

[7]This figure is consistent with the actuarial cost illustration presented in Dan M. McGill, *Fundamentals of Private Pensions,* 3rd ed. (Homewood, Ill.: Richard D. Irwin Co., 1975).

[8]Bankers Trust Company, *ERISA Related Changes in Corporate Pension Plans,* 1976.

annuities, all of which are essentially undisturbed by this section of ERISA.[9] Multiplying this figure by the proportion of all pension contributions going into insured plans (29 percent) and adding the estimated proportion of funds in profit-sharing plans, we find 31 percent of contributions unaffected. Of the remaining funds probably no more than a third were not following ERISA's dictates; this represents about 23 percent of all contributions. Even if this group had previously been making only the minimum payment into their pension funds, their 8 percent increase in contributions would imply only a maximum 2 percent change for retirement plans as a whole.

The effect of the new rules regarding recognition and amortization of experience gains and losses will depend on the experience of particular plans, of course, but the rules are likely to cause a liberalization in actuarial assumptions. Because experience gains can now be credited much more slowly, employers will probably insist that any actuarial assumptions so conservative as to have consistently given rise to experience gains in the past, be revised to be more accurate. (And, of course, actuaries tend to be conservative in their assumptions.) This revision of actuarial assumptions will probably cancel out most of the increase which would be mandated by more liberal vesting and increased funding. A 1/2 percent increase in the assumed interest rate will, on the average, lower normal cost by 12 percent.[10]

These rule changes will also have other effects. First, the experience gain and loss rules will probably cause a decrease in the proportion of pension fund assets invested in the stock market; plans will favor bonds because they can be valued at cost during their lifetime, while stocks must be valued at market value. Thus, a pension fund containing only bonds will have quite predictable outlays, since changes in interest rates will not generate changes in the minimum contribution. Three years of a declining stock market, however, could cause a large increase in the mandatory minimum contribution of a fund whose assets were entirely in stock; this, of course, could be very badly timed from the company's point of view if its profit experience has been correlated with the market. The second important effect of these provisions of ERISA will be to increase the cost of defined benefit plans relative to defined contribution plans, especially for firms that chose a previous funding policy which did not conform to ERISA, since defined benefit plans are the only ones affected by these funding provisions, as well as by the insurance provisions discussed below. ERISA will therefore promote the relative expansion of defined contribution plans; these can be used as supplementary plans and are therefore likely to be the vehicle for a large part of the future growth in pensions. Since defined contribution plans rarely give credit for past service, the rate of growth of total pension liabilities will be slowed by this substitution.

[9]Institute of Life Insurance, *Pension Facts, 1975.*

[10]McGill, *op. cit.*, p. 324.

In summary, then, the new provisions of ERISA affecting the minimum contribution to pension funds are likely to have very little, if any, effect on the flow of funds into pension funds. Plans covering at least half of the workers covered by pensions will not be affected, either because they are not defined benefit plans or because they had already been following the rules ERISA dictates. Among the remainder, liberalizations in actuarial assumptions in response to the experience recognition rules will probably cancel out the effect of quicker funding. Even if this does not happen, though, 30- or 40-year amortization of the unfunded liability will add very little to pension fund contributions. (For those who like long-run projections, I feel reasonably confident that any increase which does occur will be offset, in the long run, by a reduction 40 years from now.)

C. *Insurance of Unfunded Liability*

Another ERISA section which affects only defined benefit plans is that which establishes the Pension Benefit Guaranty Corporation. This institution will gradually insure the unfunded liabilities of plans, so that workers can collect what they have been expecting even when their plans terminate because of a merger or financial difficulty of their employer.

Although the initial (mandatory) premiums for this insurance will not add significantly to cost, the experience of the corporation may show that premium rates may have to be raised substantially. Perhaps more important, however, is the fact that for the first time, a company's unfunded liabilities, up to 30 percent of its net worth, are a liability of the company. This occurs because PBGC has recourse to the company for up to this amount in case of plan termination. Although this contingent liability will be insurable beginning in 1979, the provision definitely adds to the cost of providing defined benefit pensions, since it eliminates the possibility that a healthy corporation can escape its pension liabilities by merging with another company and terminating its plan.

D. *Fiduciary Responsibility and Reporting Requirements*

ERISA imposes Federal standards on the reporting of retirement plan information to participants and on the conduct of the fiduciaries who control the plans' assets. These provisions apply to all pension plans and will moderately increase the cost of providing a pension to a firm's workers. Under previous law, fiduciaries were prohibited from engaging in activities which led to a conflict of interest and in certain other prohibited transactions, but the penalties were administered either by the states, whose enforcement activities were uneven, or by the Internal Revenue Service, whose only available penalty was the removal of the plan's tax-qualified status. The IRS was reluctant to use this power, since it could have harmed the plans' participants more than the company. ERISA imposes even stronger standards of conduct on plan fiduciaries and makes them personally responsible for any losses which occur as a result of their not adhering to these standards. The law now requires that assets must be

invested with prudence and diversified to avoid risks of large losses. Although companies can insure fiduciaries against this liability, a recent poll of pension fund managers indicates that overall investment strategy has become more conservative as a result of this provision.[11] Defined benefit plans are also subject to an additional restriction — no more than 10 percent of their assets may be invested in the stock of a contributing employer. ERISA also imposes reporting requirements on employers; annual financial and actuarial reports, as well as individual statements of vested rights, must be given to employees.

Thus, these provisions of ERISA increase the cost of pension plans in several ways. The fiduciary responsibility rules will increase the conservatism of plan investments and thus lower their overall return. The necessity of insuring fiduciaries and of providing various annual reports will increase the administrative cost. And the limitations on investment in employers' stock will increase the relative cost of defined benefit plans.

E. *Individual Retirement Accounts*

Before ERISA, the only way that an employee could engage in fully tax-sheltered saving for retirement was through an employer-sponsored pension plan. It seems to me, in fact, that this monopoly of tax savings by employers was largely responsible for the passage of pension reform legislation, since it was very costly for individual employees to guard against the risk of pre-vesting separation from their employers by doing their own saving. Ironically, ERISA ends this monopoly. It allows workers who are covered by a contributory pension plan but who choose not to join and workers whose employers have no pension plan to establish Individual Retirement Accounts. Each year a worker may contribute up to 15 percent of his salary, but no more than $1,500, to an IRA in a bank, credit union, savings and loan association, insurance company, or to the purchase of special U.S. Government retirement bonds. The new tax law also allows couples to establish an IRA for nonworking spouses. This contribution is deductible from U.S. income taxes in the year in which it is made, and its subsequent earnings are exempt from taxes until the funds are withdrawn (which can be done after age 59 without penalty.) Only Social Security and some states' income taxes have to be paid on IRAs, so that they enjoy almost all of the tax benefits of tax-qualified plans. Workers who leave a job are also allowed to establish an IRA into which they can place their previous contributions to their former employer's plan.

This change removes one of the major sources of growth in pension plans discussed in Section I. For some workers, it may be more advantageous than a traditional pension plan, since all contributions are fully and immediately vested. Although the annual limitation of $1,500

[11]"Pension-Fund Managers Made Wary by 1974 Law," *Wall Street Journal,* August 4, 1976, p. 13.

may appear too low to make the IRA a universal alternative to the employer pension plan, recent surveys have indicated that firms which have pension plans contribute an average of 4 to 5 percent of payroll to their funds.[12] Thus, an individual with a $30,000 income who contributed $1,500 a year to his IRA would be able to provide himself with the equivalent of a respectable contribution pension plan. On the other hand, IRAs do not provide group rates for annuities and may earn less than the average pension fund (although the 8.17 percent annual yield currently being offered on 6-year savings certificates probably compares favorably with current pension fund returns.)

It is quite likely that the existence of IRAs will cut sharply into membership among younger workers in contributory plans in which workers have an option to join and will increase withdrawal of contributions by workers who leave a job in which the pension plan was contributory.[13] This will happen because a worker's pension contributions are usually a constant percentage of his salary over his entire career, while the present value of the pension benefit he buys with this contribution rises sharply with age and service. For young, recent entrants the contribution is greater than the value of their accrued benefit. They have an incentive, therefore, not to join the plan or to withdraw their contribution when they leave. Although this is already common among contributory plans, it will become an even more common practice.

It is thus conceivable that IRAs could provide stiff competition for employer pension plans, especially defined contribution plans. The advantage of full and immediate vesting could be quite important to many workers, since average job tenure, even among older workers, is low enough so that many workers in companies with plans will not be vested even under the new ERISA standards.[14] Although defined benefit plans with the final-pay benefit formulas still provide the worker with advantages which cannot be matched by the IRA, the existence of this option will probably reduce the pressure for growth in coverage of workers whose employers do not now have a plan. Still another possibility is an increasing pressure for defined benefit plans to be contributory so that the large number of unvested workers could contribute to IRAs. If a large number of low seniority workers contributed to IRAs, the cost of the plan to the firm would be reduced, which would allow firms which had strict vesting conditions before ERISA to make up for the reductions in benefits that ERISA may initially cause.

[12]Skolnik, *op. cit.*

[13]Somewhat less than one-third of covered workers have plans in which employee contributions are either required or optional. See Skolnik, *op. cit.*

[14]Of all covered workers in 1972, 56 percent had less than ten years of service on their current job. (*Coverage and Vesting of Full-Time Employees Under Private Retirement Plans: Findings from the April 1972 Survey,* U.S. Bureau of Labor Statistics, Report No. 423).

III. The Impact of ERISA on the Growth of Pension Funds

The implication of the above analysis of ERISA's main provisions is that the new law will make little, if any, difference in pension fund contributions. This section summarizes the law's effect on two potential sources of growth: extension of pension plans to workers not currently covered, and expansion of already existing funds.

In all these areas discussed in Section I, ERISA reduces an employer-sponsored retirement plan's advantages as a vehicle for a worker's savings. The new IRA option reduces the tax advantage, the fiduciary conduct rules reduce the rate of return advantage, and the various reporting requirements the administrative cost advantage.

It should be noted that many of the establishments which have no plans are relatively small, and that these are the firms which will react most strongly to the costs of reporting and of insuring fiduciaries.[15] Companies will be discouraged from establishing defined benefit plans by the additional burdens imposed by the insurance plan, by the creation of a contingent liability if the plan commences with an unfunded liability, and by the reduced flexibility in the timing of contributions. IRAs will be a good substitute for defined contribution plans, especially because the fiduciary conduct rules may lower the return which plan managers are able to achieve and because they offer full and immediate vesting.

It is unlikely, however, that IRAs will generate a large volume of new retirement savings. The establishment of pension plans before ERISA was not difficult; workers who desired to commit savings which could not be tapped until retirement could find an employer willing to establish a plan. Thus, the workers not covered under a private plan, many of whom were young or had relatively low wages, did not want to divert any of their current income into assets so illiquid that they could not be touched until old age. The IRA option, therefore, will probably not induce much new retirement savings among these workers.

ERISA will probably have only a small, positive effect on the growth of pension funds which already exist, especially if the above argument about the impact of vesting changes is correct. The new vesting rules will increase slightly the unfunded liability of some plans, and the new funding rules will speed up the funding of this liability by some plans, but the total effect, as I have indicated above, will be quite small. Even a little liberalization of actuarial assumptions will eliminate any net impact. The insurance and funding provisions will encourage some shift from defined benefit to defined contribution plans, especially among single employer plans. It is quite possible that future growth in pension benefits will take place almost entirely in the form of supplementary defined contribution plans; workers will be guaranteed a basic defined benefit, but will derive much of their retirement income from a defined contribution scheme.

[15]Emerson Beier, "Incidence of Private Retirement Plans," *Monthly Labor Review*, July 1971.

Since past service is rarely recognized in defined contribution plans, this trend will discourage the creation of past service liabilities from plan amendments, which has been a major source of growth in pension funds in the past.

Discussion

Roger Murray*

Given the flexibility of what might be described as generally accepted actuarial principles, there are many variables about which we lack experience. That is to say, we lack experience in the new environment that has been created by the Employee Retirement Income Security Act of 1974. Working with these uncertainties, I think Professor Weiss has made a very careful and valid analysis of the impact of the Act on private pension funding. His conclusion that the effects on the growth rate for defined benefit plans are likely to be partially offsetting and not material in the aggregate is well supported by what we know now.

He correctly points to the fundamental change in the thrust of pension regulation. Formerly, we lived in a world in which the Internal Revenue Service objected to low interest rate assumptions and tried to find any form of reserve account or device to accelerate the funding of pension liabilities. The IRS, of course, saw every contribution to a plan as a tax deduction which in their view eroded the revenue base. They were quite happy with minimum levels of funding. It remains to be seen how this very basic change in the regulatory climate will affect future funding decisions. Professor Weiss has made, it seems to me, an excellent analysis of the factors at work.

Let me speak briefly on just a few points that he raised. Since the Individual Retirement Account is, as far as I can tell, my brainchild, you can rest assured that I regard it as a major breakthrough. But I have some reasons beside pride of authorship. As long as the private pension system covered only about one-half of the eligible work force, the case for replacing much of it with a public OASDI system designed to be "adequate" could be persuasively argued. If the coverage of IRA plans goes as far as it may, it will remedy a basic and fundamental weakness in the narrow coverage of the private system.

A second point, it seems to me, about retirement saving generated through IRAs is that they will be considerably less than a complete substitute for other forms of saving. They will represent therefore, some net addition — possibly a substantial amount — to the accumulation of capital in contractual saving form. I don't know how to predict the volume of

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IRA saving some years from now; but if one-half of the eligible participants put one-half of the $1500-a-year limit into IRAs, the total would amount to $11 1/4 billion a year or 50 percent more than some recent years' additions to private pension plans. It is not inconceivable that the $1500 limit will be increased further as it already has been on a very modest scale. The fact that upwards of $2 billion has already been contributed to IRAs suggests that such levels of accumulation could occur in a few years' time. This would, of course, represent some displacement of defined benefit plan assets for the reasons which Professor Weiss has given. My clearly prejudiced conclusion, then, is that Professor Weiss is eminently sound in emphasizing the role of the Individual Retirement Accounts in the future pattern of retirement saving. If deposit institutions and life insurance organizations continue to dominate the IRA market as they have thus far, the net effect on the capital markets will presumably be some shift to bond and mortgage investments and away from variable assets like common stocks.

For a final observation on the effects of ERISA, let me challenge, or at least suggest that we examine carefully, the conventional wisdom about the effect of ERISA on asset management which I believe Professor Weiss has generally adopted in his paper. The conclusion in a short form is that private pension plans will shift away from variable assets like equities and concentrate more heavily on fixed income assets. The reason why I think this trend should be questioned, even if not denied, is that a major part of what has been happening to asset managers is the aftermath of the trauma of 1974 which has conditioned them to worry about a shrinkage of market values. Also, a good deal of scary legal advice is in circulation; all of us know that the best technique to establish and perpetuate a high retainer for a law firm is to present the most worrisome picture imaginable and then show how the client is being saved from disaster almost daily.

With the development of ERISA all kinds of scary headlines are devoted to what this new monster, the Pension Benefit Guaranty Corporation, is about to do. A provision in the law says that PBGC can determine that its own long-run loss would increase unreasonably if a plan were not terminated. From that passage, you can picture sleuths and examiners fanning out from PBGC and looking over the shoulders of pension managers. At the first sign of market depreciation or weakness, they come marching in and say, "We are terminating your plan because it presents the possibility of unreasonably large loss to us as guarantors." Suddenly PBGC has become the counterpart of the FDIC. I have found this most extraordinary. In 18 months spent with the staff, the committees, and other people of PBGC, I found no such organization and no such inclination. On the contrary, the people of PBGC seem to have read that other provision of the Act which says that one of its primary purposes is "to encourage the continuation and maintenance of voluntary private pension plans for the benefit of their participants."

The other factor at work is that in due course PBGC can offer for sale to the employer what is in essence a put. For a premium, the employer will be able to shift to PBGC the contingent liability up to 30 percent

of net worth for an insufficiency in the plan. In the past, perhaps not as a legal matter but as one of a going concern, the company stood behind the delivery of promised benefits to present and future employees without having access to such a device to limit losses as is contemplated in the PBGC insurance program. Other things equal (they are probably not entirely equal in this case), therefore, one should be better prepared to take those risks associated with the prudent expert's fiduciary responsibilities of asset management than before.

Also, there is a significant development in the whole concept of determining what is a sufficient plan. The concept which PBGC has so far applied is that all assets and liabilities are valued at market. According to present policy for the determination of a plan's liabilities PBGC is committed to using the market rate of interest adjusted as frequently as necessary to bring it in line with the prevailing environment. That is to say, you can comfortably buy a long-term bond because if it declines in value, the amount of your liabilities will be reduced by the higher rate of discount reflected in the depreciation of your bond.

It is a somewhat more difficult step for PBGC to apply the same reasoning to equities. In the fall of 1974, when worry and pessimism were widespread, it wasn't easy for PBGC to sit down and say, "Don't worry about the depreciation in your stock account. We know now that at this level the expected return is somewhere around 18 percent per annum and we will use that in calculating the present value of your liabilities. The fact that the market value of your assets has shrunk does not give rise to a major problem because your liability structure has been similarly adjusted to market rates of expected returns."

There is a critical question, obviously, as to how the Act is administered and how liabilities are determined. But one should not assume that we are stuck with the old traditional approach of accepting an interest rate for all time and applying it indiscriminately in all different kinds of market environments. At least so far, PBGC has been rational and realistic in determining the rate for calculating liabilities. Its initial rate, as you may all know, was 8 percent which is some evidence of realism.

If it becomes increasingly apparent that much of the legal counsel given to corporate decision-makers is unrealistic and in the scare category, it seems to me that the effect of ERISA on asset management and on the division between fixed and variable assets will be quite modest. We are likely to return to rational decision making.

The final observation that we might also keep in mind is the interesting question of what would happen if ERISA were extended to state and local government retirement systems. Here the significant matter, entirely apart from the questions of funding requirements, would be the application of the standards of the prudent expert and of fiduciary responsibility to the trustees of these retirement systems who have stood quietly by and watched a series of what would be prohibited transactions under ERISA take place. The trustees of the New York City Retirement System

have stood by and watched the erosion of their funds with complete disregard for the primary purpose of ERISA: to invest the funds for the exclusive benefit of the present and future participants in the retirement plans. My feeling on this issue is that there are all kinds of good reasons for extending at least some major provisions of ERISA to state and local government systems; but it is most unlikely that the Congress will in fact comply with the provisions of the law that require a complete and thorough study of this matter. They will not wish to take up what they regard as a political "hot potato." The Congress will eagerly seek to postpone and avoid this issue as long as conceivably possible.

Public Pension Funding and U.S. Capital Formation: A Medium-Run View

Benjamin M. Friedman*

Questions about capital formation and the implications of a potentially increasing scarcity of financial capital in the United States have recently emerged as important public issues, not just as a matter of long-range planning but as an object of concern in the medium run, too. There are reasons for expecting both the overall scarcity of investment capital and, perhaps more importantly, the relative scarcity of long-term capital to increase during the coming five to ten years. As a result, private businesses may have to postpone or abandon plans for new physical investment undertakings, thereby further reducing the prospects for meeting medium-run national goals dependent on capital formation. Many individuals and some institutions have therefore called for public policy initiatives to bolster physical capital formation against the pressures of financial capital scarcity.

Not surprisingly, proposals for change in the funding of pensions have figured prominently in these discussions. As of the end of 1975, the pension funds of private businesses and state and local governments had financial assets of $255 billion, of which $224 billion represented equity interests in or debt liabilities of U.S. corporate businesses.[1] Including the roughly $40 billion of government securities in the Social Security Trust Fund, the total financial assets of pension funds amounted to some 20 percent of the combined equity and outstanding debt of the U.S. nonfinancial corporate business sector. Even with no changes in their current structure, therefore, pension funds already represent a substantial pool of financial capital invested in American industry. Furthermore, this pool is also growing rapidly. In 1975 the pension funds of private businesses and state and local governments purchased, net of sales and retirements, $24

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[1]Data are from the Federal Reserve System's Flow of Funds accounts.

billion of additional financial assets. By comparison, the economy's total personal saving (including pensions) in 1975 was $84 billion, and the entire net external funds requirement of the nonfinancial business sector was only $37 billion.[2]

While both this $255 billion asset stock and the corresponding $24 billion annual saving flow already render pensions a major consideration in any assessment of the prospects for financing U.S. capital formation, several pension experts have proposed plans for increasing pensions' saving flows — and therefore pensions' accumulation of asset stocks — to magnitudes which would dwarf the Nation's prior experience. Alicia Munnell and Ann Connolly [31], for example, have estimated that the liabilities of state and local government pension funds now exceed these funds' assets by some $270 billion and that the growth of their liabilities is continuing to outpace the growth of their assets. Their analysis has indicated that simply funding the new liabilities which accrued during 1975 would have required an additional $5 billion of asset accumulation by these funds, and that making one year's start toward a relatively slow (40-year) amortization of the currently unfunded liabilities would have required yet an additional $8 billion. Even these magnitudes, which pertain only to the 13 percent of the civilian labor force who worked for state and local governments during 1975, are potentially of substantial consequence for the Nation's capital formation. With $4 trillion in unfunded liabilities of the Social Security system, then, as Martin Feldstein [15] has shown, the stock and flow magnitudes implied by various Social Security funding proposals can easily reach vast proportions, with correspondingly far-reaching potential consequences for capital formation.

The object of this paper is to address two apparent vacuums in the existing literature relating pension funds to financial capital markets and, via these markets, to physical capital formation.

First, analyses of the potential macroeconomic impacts of pension funding proposals usually focus on a time horizon which is quite long by the standards of policy-oriented macroeconomics. Exploiting the comforting reliability of mortality tables in comparison with less firmly grounded macroeconomic relationships, such studies usually take the reader at least into the twenty-first century if not half way through it. In contrast, the concern of this paper is the medium run of the next half-decade to decade — say, for example, about the length of two Presidential administrations. It is within this relatively shorter time period that arguments about an increasing scarcity of financial capital, with negative implications for physical capital formation, seem to have substantial validity.[3] The U.S. financial markets' proven capacity for innovation effectively

[2]Businesses' external funds needs were unusually small in 1975; the 1970-74 annual average was $58 billion. The point remains, however, that net saving via pensions is a large share of this total even in normal years.

[3]It is relatively easy, but not particularly instructive, to refute many of these arguments by transplanting them into a long-run equilibrium time frame; see Section I below.

precludes having confidence in an extrapolation of this medium-run financial scarcity much beyond the next decade.

Secondly, to date most analyses of this subject have dealt exclusively with the overall scarcity of (by implication, homogeneous) financial capital and have largely neglected the more specific problem of the increasing relative scarcity of long-term capital. This capital homogeneity assumption is particularly inappropriate for purposes of studying the economic effects of funding proposals for pensions, since pension funds (for very sound reasons) do not behave like typical investors. Furthermore, the specific characteristics of pension funds' portfolio behavior turns out to be of crucial importance in the context of prospects for an increasing relative scarcity of long-term financial capital in U.S. markets during the medium-run future. This paper therefore looks at pension funds in a framework which recognizes two essential forms of heterogeneity. First, different financial instruments are not perfect substitutes. The distinctions among different assets and liabilities — in particular, between long-term and short-term maturities — do matter and are important. Secondly, different market participants do not share identical portfolio preferences and behavior. The distinctions among different categories of borrowers and lenders — in particular, between pension funds and individual savers — also matter and also are important.

Section I briefly indicates why capital formation is important for achieving a number of the Nation's medium-run economic goals and discusses the implications in this context of focusing on a medium-run time frame rather than on a long-run equilibrium. Section II reviews the reasons why both the overall scarcity of financial capital and the relative scarcity of long-term capital may be important factors causing medium-run U.S. capital formation to be inadequate. Sections III and IV examine the capital market implications of Munnell's and Connolly's proposals for Federal civil service, military, and state and local government pensions, and Feldstein's proposals for the Social Security system. Section III uses my earlier [18] set of estimates as a framework for analyzing these proposals from the viewpoint of the overall scarcity of financial capital. Section IV then adopts a partial equilibrium approach to facilitate analyzing these proposals from the viewpoint of the relative scarcity of long-term capital; part of this analysis relies on the structural model of the determination on long-term interest rates which I have developed in previous work [21, 22]. Section V briefly summarizes the paper's principal conclusions.

I. Capital Formation and National Economic Goals in the Medium Run

At the outset it is useful to review the reasons why the U.S. economy's rate of capital formation during the next five to ten years has become a major object of public policy concern. Put the other way around, the relevant question is why many disinterested observers are reluctant to

accept that rate of capital formation which they expect the U.S. economy to generate during this period in the absence of public-policy initiatives.

The predominant answer is that, as the economy recovers from the severe 1973-75 downturn in business activity and the focus of attention shifts accordingly from the problems associated with the depths of the recession onto the economy's needs for the remainder of the 1970s and on into the 1980s, it is becoming clear that new fixed-capital formation will be essential for achieving many of the Nation's economic objectives for these years. New plants not only will provide jobs for re-employing those who are out of work and employing new labor force entrants but will also provide added production capacity for avoiding specific inflationary shortages as the economy expands. Modern equipment will increase the economy's productivity, thereby permitting a rising standard of living through wage increases which do not raise unit labor costs, as well as helping the United States to compete vigorously with foreign producers who have been quick to take advantage of newly evolving technologies. New equipment will also enable American industry to meet higher standards of worker and product safety and environmental protection. New and remodeled power generation facilities will enable businesses to shift their energy consumption patterns so as to economize on increasingly expensive and scarce fuels. New investment in energy exploration, production and development will reduce American dependence on uncertain foreign energy sources.

To prevent misunderstanding, it is important to emphasize that this set of rather widely accepted national goals represents a set of medium-run economic objectives. Some may still be important objects of concern a decade hence, but of course both the relevant underlying economic situations and the public's preferences may change in important ways between now and then. For the five to ten years immediately ahead, however, these objectives rank high on the Nation's economic agenda.

The medium-run nature of these goals is significant in the context of policies for promoting capital formation because, as Feldstein [16] has demonstrated in a paper which does not take account of the medium-run context of much of the current discussion, the link between some of these goals and capital formation would not be valid in a long-run equilibrium context. In the long run, for example, the substitutability of capital and labor in the production process would indeed absorb any unemployed workers, regardless of the size of the capital stock. The shift of production technology which such substitution would require, however, seems of limited relevance for the next five or ten years, much less for the objective of significantly reducing the economy's unemployment rate between now and the end of the 1970s. Similarly, in the long run any increased productivity consequent upon greater capital formation would simply lead to higher real wages without bearing any necessary implications for either the economy's rate of price inflation, which under familiar assumptions will de-

pend on the rate of growth of the money stock,[4] or its international competitiveness. By contrast, in the short- and medium-run context of both limited wage flexibility and oligopolistic pricing behavior which determines prices according to normal average cost up to a mark-up reflecting competitive entry-preventive considerations, it is difficult to apply this argument to the coming few years which may be crucial to the rekindling or subsidence of price inflation as the economy moves closer to its full potential growth path. Again in the context of avoiding a resurgence of price inflation in the medium run, arguments structured in a long-run equilibrium mode necessarily assume intersectoral supply-demand balances and therefore ignore the possibility of inflation-generating shortages in particular key industries.[5]

Perhaps even more importantly, discussions of capital formation in terms of long-run equilibrium also ignore the implications of two current sources of capital formation requirements which have arisen quite suddenly and which are likely to be of significant magnitude during the next half decade or more.

First, in addition to whatever merits "energy independence" may have as a public good, both the sudden escalation of the cost of fossilized energy sources and the increasingly uncertain outlook for availability of particular sources such as natural gas will lead businesses in the United States to undertake a substantial amount of fixed investment which has no direct parallel in the economy's post-World War II experience. Some parts of this energy-related investment will provide the equipment and manpower to undertake costly searches for new energy sources such as offshore oil and gas deposits. Others, such as the multibillion dollar pipeline projects now under construction in Alaska and under consideration for northwest Canada, will transport fuels from newly developed but not readily accessible sources to their U.S. users. Still others will reflect the adjustments in production methodology and product design which a broad range of industries must now make because of the shifting structure of relative energy costs and availabilities.

Secondly, the increased public emphasis on environmental preservation and improvement, as well as on worker health and safety, will continue to require U.S. businesses to undertake some additional fixed investment. As is the case for much of the investment devoted to energy development, pollution-control equipment represents an additional investment input to the production process; but, since neither clean air nor

[4]The long-run relationship between the money stock and the price level is less straightforward than often supposed, however. No one knows how an electronic funds transfer system, for example, or the payment of interest on demand deposits, will influence monetary velocity.

[5]See Bosworth [6], for example, for a discussion of the prospects for shortages in several important U.S. industries.

clean water has economic value in the gross national product (or brings a direct economic return to those companies abating their pollution), it does not add to the amount of output being produced.

In both cases, the basic point is that new fixed capital is required for reasons not directly associated with the production of economic output as conventionally defined in the National Income and Product Accounts. Since measured gross national product includes neither the advantages of energy independence nor environmental and health benefits,[6] these two considerations imply (with all other factors held equal) an increase in the economy's measured capital-output ratio.

In the long run, the U.S. economy will presumably adjust fully to both of these additional sources of demand for capital formation — that is, if both persist in the long run — so that the rate of return on the marginal dollar devoted to capital formation will just balance the public's preferences between consumption today and consumption tomorrow.

For the medium run which is the immediate cause of public policy concern, however, the way in which the economy will adjust is less certain. Will the total capital formation rate remain fixed, so that the new investment devoted to energy independence and to the environment and to worker and product safety will simply replace the more traditional investment which would have created new jobs and expanded conventionally defined production capacity? If businesses seek to increase the total capital formation rate, so as to undertake this new investment without sacrificing the more traditional investment, at what yield will the financial markets accommodate the increased demand for investment capital? Apart from the question of the required yield on investment, will the financial markets (or some other element of the decentralized economy) impose effective quantity constraints on investment by certain businesses?[7]

These are the concerns which have motivated the debate about the medium-run prospects for U.S. capital formation.

II. Physical Capital Formation and Financial Capital Markets.[8]

Since World War II, investment in plant and equipment in the United States has averaged only about one-tenth of the Nation's total output — somewhat less in the 1950s and early 1960s, and somewhat more in the late 1960s and early 1970s. This capital formation rate has been very low in comparison with that of other industrialized countries around the

[6]Measured gross national product could even decline in response to the implementation of health and safety regulations which would reduce the consumption of medical services.

[7]Given the complex institutional and regulatory character of the existing financial markets, interior solutions need not occur for all variables, especially in the short or medium run.

[8]This section draws on some of my previous work; see especially Friedman [18, 19, 20].

world; in some Western European countries and in Japan, for example, business fixed investment as a percentage of gross national product has typically been between one-fifth and one-quarter. Furthermore, as a result of the deepest business recession since the 1930s, in 1975 the share of U.S. output devoted to plant and equipment expenditures dropped once again below the 10 percent mark. This decline, however, has almost certainly been a temporary cyclical phenomenon. For all of the reasons discussed in Section I, U.S. businesses in the coming decade are likely to seek to apply toward investment in plant and equipment significantly more than the recent average 10 1/2 percent of gross national product. Especially if the current cyclical recovery develops into a sustained business expansion, a major force in the U.S. economy during the next five and more years will be the attempt to increase the fraction of the gross national product devoted to fixed investment.

Investment, however, must be financed. At the level of the individual company or individual project, capital appropriations are restrained by the ability to generate funds internally, through undistributed after-tax profits and depreciation allowances, and/or to raise external funds in the credit markets. At the level of the overall economy, total investment must equal total saving.

During the next five years in the United States, financial considerations may, to an unusually great extent, act as effective constraints limiting the amount of fixed investment in plant and equipment which the economy in aggregate is able to do. Such restricted availability of financial capital would, in the absence of offsetting public-policy initiatives, limit the economy's ability to achieve those objectives which depend upon formation of new physical capital.

This restraining role of the financial markets would, in turn, result from two closely related kinds of developing scarcity reflecting two forms of balance which are essential aspects of the functioning of a market economy. First, the economy's overall investment total must equal the overall total of the economy's saving. Secondly, since specific kinds of investment typically rely on particular respective methods of financing, and since savers are not indifferent among alternative financial vehicles, the respective supplies of and demands for specific heterogeneous financial instruments must also be equal.

The Overall Scarcity of Financial Capital.[9] An important key to understanding the functioning of any economy is the truism that, on an ex post basis, the economy's saving must equal its investment. Since it is unlikely in a decentralized market economy that *ex ante* plans for saving

[9]As the following paragraphs indicate, the familiar allegation that the concerns about capital formation from a financial viewpoint reflect a failure to recognize that markets do clear (see, for example, Eisner [13] and Feldstein [16]) is simply false.

and investment will precisely balance one another, the market mechanism must influence the decisions of businesses and consumers so as to change these inconsistent *ex ante* plans into consistent *ex post* actions. Financial markets play a large role in this mechanism, generating adjustments in the real yield which the market pays to savers as suppliers of funds and in the cost and availability factors which confront those who demand funds to invest in plant and equipment, office buildings, inventories, and residential construction. If plans to supply funds exceed plans to demand funds, the market excess leads to increased availability and a decline in yields. If plans to supply funds fall short of plans to demand funds, the market shortage leads to reduced availability and higher yields. The result is that, *ex post,* saving equals investment.

No independent increase in the U.S. economy's private saving seems likely, during the next five to ten years, to mirror businesses' efforts to raise funds to finance an increase of their investment in plant and equipment from the recent pre-recession level of about 10 1/2 percent of U.S. gross national product. Capital would therefore become more scarce as the financial markets created incentives, in the form of increased real yields on and reduced availability of financial capital, for individuals to save more and for businesses to invest less.

This prospect of increasing capital scarcity bears significant implications both for individual firms' business decisions and for public policy.

First, for most individual companies, the problem would appear as a rise in the inflation-adjusted market cost of capital.[10] This increasing after-inflation cost factor would be the major fulcrum of the process which will inevitably result in supply equaling demand in the market. The specific mechanism equating supply and demand could involve many proposed projects which businessmen in a wide variety of industries are discussing today and which seem potentially profitable when evaluated at the cost of capital which has prevailed on average over the past decade. By contrast, five years from now, when evaluated at the then-prevailing cost of capital, many of these same projects could seem unprofitable, even though the respective underlying operating considerations may have remained unchanged.[11] If businesses then decided to defer or abandon such projects, the economy would forego whatever benefit they would have provided.

In addition, for companies perceived to be of less than top-quality credit-worthiness, the problem would also appear as an intensified lack of

[10]It is important not to associate this phenomenon with a statement about observed market interest rates except in the context of some specific assumption about expectations of future price inflation.

[11]Brainard and Tobin [8], relying on measurements of the market value of the Nation's capital stock to its replacement cost, have argued that the "real" cost of capital began to rise significantly as early as 1973-74.

market availability of capital. As capital became more scarce on an overall basis, the availability of capital to these particular borrowers could become even more restricted. A company of less than top-quality credit standing would find that it is willing to pay a modest premium over the price of capital which it sees more stable or established companies paying, but that capital is nevertheless unavailable to such a company, and investment opportunities would effectively be limited to only a part of the U.S. business sector.[12]

From the standpoint of public policy, the problem of increasing capital scarcity would appear as an insufficient amount of financial capital being raised in the markets — insufficient in comparison with goals for physical capital formation for jobs, price stability, increasing capacity and productivity, environmental improvement, health and safety enhancement, international competitiveness, and energy conservation and independence. As Section III below shows, innovations in funding public pensions can make a significant difference for this developing overall scarcity of financial capital.

The Relative Scarcity of Long-Term Capital. The second form of balance which is essential to a market economy with several heterogeneous forms of capital — equality of the respective supplies of and demands for specific financial instruments — could lead in coming years to a further important development in the form of a shifting of relative scarcities within the overall U.S. capital market. In particular, while capital of any sort will become increasingly scarce, the scarcity of long-term capital is likely to increase even more.

Since all forms of financial instruments are not equally suitable for financing business fixed investment, it is important to any analysis of the prospects for capital formation to ask how U.S. businesses will seek to meet the enormous and growing needs for funds which will result from their increasing investment expenditures. The liquidity position of the nonfinancial corporate business sector of the U.S. economy — measured by any of a number of familiar ratios — deteriorated substantially and almost continuously from the end of World War II until a year or so ago. Some of this decline, especially in the early postwar years, presumably represented only a descent from the economy's abnormally high overall liquidity position caused by the wartime government financing. More recently, however, the trend has continued significantly further, greatly increasing the financial risk exposure of many businesses.[13] Businesses' willingness to continue to increase their risk exposure during the latter half of the postwar period in part reflected the then-prevalent attitude that the business cycle was a phenomenon of the past and that the U.S. economy would thenceforth expand continuously and indefinitely.

[12]The access to the public debt and equity markets of corporations rated less than A has been very limited for the past several years.

[13]Wallich [36], for example, has advanced this view of the trends in business liquidity during the postwar period.

The business recessions of 1970-71 and 1973-75 have probably arrested this trend toward increasing financial risk exposure. The bankruptcies of Penn Central and Grant's — and the widely publicized near misses of one after another major corporation, not to mention public sector borrowers — have carried an important message both to corporate borrowers and to investors. After observing the difficulties associated with short-term indebtedness, which many companies have experienced in the recent years of turbulent economic situations in general and financial markets in particular, many businesses will probably seek to reduce their financial exposure. Furthermore, the allocation of debt funds through the credit markets has already made clear that investors have taken on an increased sensitivity to borrowers' risk exposure. Highly exposed would-be borrowers will find financing increasingly unavailable.

Even apart from any question of restructuring the nonfinancial corporate business sector's $611 billion *stock* of currently outstanding liabilities, however, the relevant question here is how this sector of the U.S. economy will meet the *flow* of new external funds requirements associated with its collective effort to increase the economy's capital formation rate. Traditional business prudence usually indicates that, in financing physical facilities with long expected life, the liabilities behind those assets should also be of long duration. After the bankruptcies, threatened defaults and other financial distresses of the past two business recessions, this simple maxim probably has more appeal today than it has had for many years. U.S. businesses will therefore increasingly attempt to finance their investment expenditures at long term. Furthermore, if the fixed investment share of the gross national product is to rise, businesses seeking to finance investment expenditures will account for an increasing share of the funds raised in the U.S. credit markets. A primary feature of these markets during the next five to ten years, therefore, will be a shift in the structure of borrowers' demands for funds toward a preference for long-term liabilities.

If investors were wholly indifferent among alternative assets, this likely shift of borrowers' preferences would matter little for the credit markets. Since in fact investors are not indifferent among alternative saving vehicles, however, it is important to ask whether the asset preferences of both individual and insitutional savers are likely to be shifting toward longer-term form so as readily to balance the probable shift in borrowers' liability preferences.

One quite unsurprising effect of the recent experience of rapid and highly variable price inflation in the United States has been to frighten many individual savers away from long-term debt commitments at fixed terms, and market performance during this period has increasingly cast doubt on the role of equities as a hedge against inflation.[14] Individuals' direct saving has therefore emphasized short-term instruments, including interest-bearing deposits of all forms. Until adequate price stability in the

[14]See, for example, Bodie [4] and Lintner [26].

economy has reassured investors that inflation will not erode the real value of their savings, direct savers are unlikely to shift their portfolio preferences to accommodate businesses' demands for long-term funds.

Direct saving is only one means of transferring funds from their ultimate sources to their ultimate users. In an advanced economy with highly developed financial markets, financial intermediaries take advantage of risk diversification and economies of scale to be able to purchase one kind of asset from borrowers and sell (i.e., issue) a different kind of liability to savers. Most such intermediary institutions have specific dominant preferences with respect to their asset portfolios, dictated in large part by the nature of the liabilities which they offer and reinforced by closely related government regulations. In the context of financing the burgeoning long-term funds requirements of U.S. businesses during the coming years, pension funds and insurance companies are of special importance. Because of the long-term nature of their liabilities, these intermediaries are the only major institutional lending groups in the United States which prefer to hold asset portfolios consisting largely of general long-term corporate capital obligations.

For the past decade, however, the corporate nonfinancial business sector of the U.S. economy has been increasing its net external funds requirements more rapidly than the insurance-pension sector has been increasing its net acquisitions of financial assets. During the next five to ten years, the volume of credit which insurance companies and pension funds extend will probably continue to grow steadily, and the new Federal pension legislation (ERISA) will probably lead to some acceleration in the growth of pension funds. Nevertheless, as has already been the case to some degree during the past decade, in the absence of some further innovation the insurance-pension sector's net lending is likely to grow significantly less rapidly than will nonfinancial businesses' demands for funds to finance fixed investment.

In sum, neither direct savers nor financial intermediaries appear likely to shift during coming years toward a preference for long-term assets. On the contrary, in the absence of public-policy initiatives or financial innovation which would make long-term instruments more attractive, direct saving will probably continue to emphasize short-term instruments, and those intermediaries which prefer general long-term corporate capital obligations will account for a decreasing share of the funds advanced in the U.S. credit markets. The resulting "mismatch" caused by the market confrontation of increasing borrowers' preferences for long-term liabilities and increasing lenders' preferences for short-term assets may result in a shift of relative scarcities within the different maturity sectors of the overall capital market which will only compound the more familiar problems associated with the economy's saving-instrument balance.[15] As Section IV

[15]While it is too early to judge with confidence, the unusally large market yield spreads between long- and short-term debt instruments in the past several years may already have begun to indicate this shift of relative scarcities.

below shows, innovations in funding public pensions can also make a significant difference for this increasing relative scarcity of long-term capital.

III. Public Pension Funding and the Overall Scarcity of Financial Capital

Munnell's and Connolly's proposals for funding civil service, military and state and local government pensions and Feldstein's proposals for funding the Social Security system represent substantial increases in the economy's institutionalized saving. To the extent that this additional institutional saving in turn corresponds to a greater saving rate for the economy as a whole, then these proposals could potentially offset some or all of the increasing scarcity of financial capital discussed in Section II.

A Quantitative Perspective for the Next Five Years. Table 1 provides a quantitative framework within which to assess the implications of some of the magnitudes involved in the Munnell-Connolly and Feldstein proposals. In an earlier paper [18] from which this table is adapted, I worked through a conditional forecast of the likely balance of saving and investment in the U.S. economy during 1977-81 — a period which I chose in large part so as to avoid dealing with the early stages of the recovery from the severe 1973-75 business recession. Among the key policy assumptions underlying this forecast were, first, that the Federal Government would undertake only modest new spending programs during 1977-81, thereby maintaining the goods-and-services purchases component of Federal expenditures at the recent 9 percent share of gross national product; secondly, that Federal taxes and transfers would increase in respective proportions which would yield a balanced Federal budget, on a national income accounts basis, on average during 1977-81; and, thirdly, that the Federal Reserve System would pursue a relatively tight monetary policy during most of this period. A balanced Federal budget on average during 1977-81 is probably an unlikely prospect, as it was when I prepared this forecast, but it serves nevertheless as a convenient benchmark for purposes of comparisons; alternative budget assumptions, of course, yield alternative conditional forecasts. The broad macroeconomic features of this forecast include 3.7 percent per annum growth of real output and 5.0 percent per annum inflation of prices (as measured by the overall gross national product price deflator) on average for 1977-81.[16]

Table 1 reproduces the relevant aspects of the economy's overall balance of saving and investment from this conditional forecast, together with corresponding historical data for three earlier five-year periods. The first half of the table expresses the various average annual flows as percentages of the associated gross national product, while the second half

[16]For further details and explanations, see Friedman [18]. It now appears that the gross national product total assumed for 1976 in preparing this forecast was probably too small by a slight margin; correcting for this error would raise all of the dollar magnitudes in the lower half of Table 1, as well as in Table 4 below, by perhaps about 1 percent.

expresses the same flows in billions of current dollars. The thrust of the strong demands for business fixed investment discussed in Section I, damped somewhat by the two increasing financial scarcities discussed in Section II, is sufficient to increase the investment in plant and equipment from the recent 10 1/2 percent share of gross national product to 11 1/2 percent. Even with some decline in the residential construction share, gross private domestic investment rises to nearly 16 percent of gross national product. On the assumption of some further development of foreign-source investment in the United States, gross investment to be financed is therefore 15 1/2 percent of gross national product — a share which the ecomomy finances according to the saving breakdown shown, including the assistance of zero negative saving (i.e., zero budget deficit) for the Federal Government. Especially in the context of the pension funding proposals to be considered below, it is worth pointing out explicitly that the "Federal Government" line in Table 1 includes not only the U.S. Treasury as strictly defined but also the federally administered trust funds.

The projected saving flows shown in Table 1 — which together represent a point on the economy's saving schedule — provide a useful frame of reference for considering the Munnell-Connolly and Feldstein proposals. These flows indicate total gross private saving averaging $342 billion per annum during 1977-81, with over half of this amount attributed to (mostly corporate) depreciation allowances. Of the remaining $155 billion per annum during 1977-81, $107 billion represents personal saving and $48 billion corporate saving (net of adjustment for the accounting profits associated with inventory price increases). In the first instance, these are the magnitudes which the Munnell-Connolly and Feldstein pension funding proposals would affect.

Issues and Assumptions. Evaluating the implications of pension funding proposals for the economy's saving behavior is far from straightforward for at least two reasons. First, to the extent that either state and local governments or the Federal Government is involved, it is necessary to anticipate the government's policy response to the expenditure requirements associated with incremental contributions. Will the relevant governmental unit finance these contributions by borrowing or by raising taxes? If the latter, then which taxes? Secondly, the relevant responses of private economic agents — including individuals in their role as consumers, individuals in their role as workers, and businesses — are matters to be determined by positive investigation of economic behavior rather than by policy assumption. Some of these issues are important to the economy's overall saving, which is the subject of this section, and some to the composition of saving which is the subject of Section IV below.

The case of Federal civil service and military workers perhaps presents the minimum number of relevant complexities. For a given proposal specifying additional percentage contribution increases for the employee and for the employing Federal agency, at least six important issues — including five sets of economic behavioral questions and one set of policy assumptions — are relevant to assessing the impact of such a proposal

on the economy's overall saving schedule:[17] (1) The first is the familiar question of the incidence of the payroll tax, which depends on the relative elasticities of the demand for and supply of labor.[18] If workers facing liquidity constraints or capital market imperfections regard their nonvoluntary pension contributions as a less-than-perfect substitute for take-home pay, to what extent will wages rise so as to restore their prior level exclusive of the forced contributions? Alternatively, if workers perceive a value of the additional employer contributions which outweighs the impact of their own required contributions, to what extent will wages fall? (2) Will the Federal Government increase taxes to finance its increased contributions (including the nominal contribution percentage assigned to it in the proposal plus the induced percentage rise or fall in the wage rate)? If so, will it increase personal income taxes or corporate profit taxes or both? (3) If corporate profit taxes rise, how much of this increase can corporations shift forward to consumers? How much can they shift backward to private sector workers?[19] (4) How will corporations divide, between smaller dividends and smaller retained earnings, that part of the added profit taxes which they cannot shift?[20] (5) If the marginal rates of personal income tax rise, what is the resulting impact on the supply of labor? What is the resulting impact on wages?[21] (6) Finally, given the ultimate net decrement of disposable personal income, how much will come out of saving and how much out of consumption?

The case of state and local government employees raises all of these same issues, with one further complication. In particular, while it is conventional in many analytical economic contexts to assume that the Federal Government can raise funds in whatever way it chooses — that is by

[17]Given the interdependence of the economic system, it is clear that considerations other than these six could also matter; the following list is not necessarily exhaustive. The partial equilibrium device of focusing on the shift in the economy's saving schedule, rather than on the ex post amount of saving, avoids the further complexity associated with estimating any corresponding induced shift in the economy's investment schedule and assessing the net results for the intersection of the two. In a general equilibrium growth model context, it would also be necessary to take account of the implications of this intersection for the growth of the economy's capital stock, and thence for the growth of output and real wages.

[18]See, for example, Musgrave [32].

[19]See Brown [9] for a survey of recent work on the shifting of the corporate income tax.

[20]In a world of perfect capital markets, no differential tax treatment between ordinary income and capital gains, and corporate managers whose sole objective is to maximuze the market values of their respective firms, this question would not arise. Under more realistic assumptions, not only is this question relevant but also it is in principle necessary to consider the market's downward revaluation of corporations' shares and the impact of the consequent wealth loss on the saving behavior of shareholders.

[21]Once again, in principle it is necessary to consider the impact of shifting labor supply not only on wages but also on employment and output.

borrowing or by increasing any of its various taxes — this assumption is less appropriate for state and local governments. Since these governmental units do not have the power to create money, their borrowing is dependent on investors' assessments of their creditworthiness, much as if they were private sector borrowers. Similarly, the power of state and local governments to raise taxes must, in the final analysis, depend at least in part on the elasticity of their respective constituents' demand for public services.

In the case of the Social Security system, the questions asked about the responses of the private business sector move from a contingent concern, which is relevant primarily if the government chooses to increase corporate profit taxes, to a major focus of attention following directly from the incremental employer contributions. Since contributions for Social Security are traditionally divided evenly between employee and employer, the immediate drain on the business sector's before-tax internal funds generation under any such proposal is equal to that of households.

Following the assumptions made (sometimes implicitly) by Munnell and Connolly and by Feldstein in putting forth their respective proposals, the discussion in this section resolves these various issues by making the following simplifying assumptions for purposes of medium-run analysis: (1) The incidence of the incremental employee and employer contributions is not shifted. There is no effect on labor supply, labor demand, output, prices or wages.[22] (2) Both the Federal Government and state and local governments will finance their incremental contributions by raising personal income taxes. (3) Corporations cannot shift their incremental contributions to Social Security. (4) The consequent reduction of after-tax corporate internal funds generation reduces dividend payouts, leaving retained earnings unchanged.[23] (5) The higher marginal rates of personal income taxation have no effect on labor supply or wages.[24]

Finally, the issue of the consumption response to increased employee pension contributions merits some specific comment. To date the professional economics literature has typically addressed this issue on the assumption that incremental pension contributions corresponded to incremental benefit prospects, so that the natural question to analyze has been whether or not the nonvoluntary saving simply replaced saving

[22]This somewhat unrealistic assumption is made implicitly both by Munnell and Connolly and by Feldstein; they assume (see Table 2 below and the associated discussion) implementation of pension funding proposals. It is necessary to adopt this assumption here also, in order to use as inputs the Munnell-Connolly and Feldstein estimates of funding requirements.

[23]Since this assumption in particular seems at best highly speculative, parts of the analysis presented below reverse it to assume that the after-tax reduction in internal funds generation reduces retentions while not affecting dividends.

[24]See again footnote 22.

which workers would have done anyway on a voluntary basis. Early empirical work by Cagan [10] and Katona [25] suggested that such substitution was small at best. By contrast, more recent work by Feldstein [14], Munnell [29, 30] which attempts to control for the effect of pensions on retirement timing decisions, argues that workers do reduce their direct saving so as to offset a large fraction of nonvoluntary pension contribtutions.

The funding proposals by Feldstein and by Munnell and Connolly, which this paper seeks to analyze, are quite different. In particular, they assume no change in pension benefits associated with the incremental pension contributions.[25] The issue at hand, therefore, is simply that of the extent of funding of the fixed benefits already committed to workers — that is, whether to pay for them now or later. In this sense the incremental pension contributions do not differ, from the standpoint of the associated consumption response, from any other nonvoluntary payment such as personal taxes. Personal disposable income falls, and the marginal propensity to consume out of personal disposable income indicates the consumption response.[26] Given assumptions (1)-(5) above, this equivalence between nonvoluntary pension contributions and personal tax payments yields in turn the result that the net addition to the economy's total saving due to incremental contributions to public sector (civil service, military, and state and local government) pensions is independent of these contributions' division between employer and employee.

Net Shifts in the Economy's Saving Schedule. Table 2 shows the net additions to the economy's total saving, measured as average per annum flows for 1977-81, associated with Munnell's and Connolly's and with Feldstein's various pension funding proposals. For each of the civil service, military and state and local government categories, the table indicates the effect of the Munnell and Connolly proposal to increase permanently the total contribution percentage by the amount necessary to fund the new flow of currently accruing liabilities and to amortize over 40 years the existing stock of unfunded liabilities previously accrued. For Social Security the table indicates the respective effects of the five different

[25]In the background of any discussion of pension funding, of course, lies the question of whether pension systems will be able -- in a political sense -- to meet their unfunded future liabilities if they continue to rely on the intergenerational transfers inherent in pay-as-you-go financing. In addition, the various Social Security proposals analyzed by Feldstein do involve two alternative benefit adjustment assumptions; this paper follows Feldstein, however, in not considering the impact on total saving of the choice between the two.

[26]Since in this context more nonvoluntary payments today mean fewer nonvoluntary payments in the future, the intergenerational transfer issue still remains. In a world of great knowledge on the part of economic agents and no effective credit market constraints on consumption, such that today's workers have already determined their saving behavior so as to achieve whatever intergenerational wealth distribution they desire, today's workers would presumably simply decrease their saving in response to the incremental contributions; see, for example, Barro [2]. Since the assumptions required for this argument to obtain are so restrictive, however, the analysis below disregards it.

proposals analyzed by Feldstein, all involving a permanent increase in the contribution percentage to a new fixed level, and all on the assumption of his "medium" case of a 6 percent "return-reinvestment rule":[27] The first two of these proposals assume that the contribution precentage rises only enough to see the Social Security system through the coming demographic bulge in benefits ("bulge only"), assuming that benefits adjust for inflation according to, first, the "wage indexing" plan and, secondly, the "price indexing" plan.[28] The next two proposals assume that the contribution percentage rises further so as to enable the Social Security system to develop a fund approximately equal in size to the gross national product by the middle of the twenty-first century ("GNP fund"), again assuming first, "wage indexing" and then, "price indexing" of benefits. The final proposal assumes that the contribution percentage rises yet further so as to enable the Social Security system to develop a fund large enough to endow all future benefits by early in the twenty-first century ("endowment fund"), assuming "price indexing" of benefits only.[29]

The first column of Table 2 indicates the pertinent average annual covered payroll for 1977-81, for each of the four categories of pensions, as assumed by Munnell and Connolly and by Feldstein. Once again, these authors' assumption that both wage rates and employment would be invariant to the different pension funding proposals, thereby leaving the payroll totals invariant, is strong but perhaps not overly inaccurate for the immediate purpose here of medium-run analysis. For the very long time periods studied by these authors in their own papers, however, the fixed payroll assumption seems highly questionable.

The second column of Table 2 indicates the increase in the percentage contribution rate, in comparison with the average for 1977-81 implied under current arrangements, required by each proposal. The third column indicates the net addition to the economy's total saving — that is, the shift in the saving schedule — which would result from each proposal under the assumptions specified above, including the partial offset from a 7 percent saving rate out of personal disposable income. Since assumption (4) above — that incremental employer contributions to Social Security come entirely out of dividends — represents one extreme, the numbers in parentheses for the five Social Security proposals indicate the correspondingly small net additions to total saving which would result, at the

[27]See Feldstein [15] for an explanation of the assumptions involved in the "return-reinvestment rule." See also the discussion in Section IV below.

[28]The "wage indexing" plan is the current Administration's proposal [35]. The less expensive "price indexing" plan is the Consultant Panel's proposal [11].

[29]Perhaps because of the magnitude by which the contribution percentage would have to increase, Feldstein did not analyze the "wage indexing" equivalent of this proposal.

other extreme, if incremental employer contributions were to come entirely out of retained earnings; the truth presumably lies somewhere between the two estimates.[30]

A comparison of the average per annum net additions to saving shown in Table 2 and the saving flows forecast for 1977-81 in Table 1 shows that the Munnell-Connolly and Feldstein pension funding proposals, if implemented, would be of great potential importance for the U.S. economy's medium-run balance of saving and investment.

The sum of the net saving additions shown in Table 2 for civil service, military and state and local governments, plus the *smallest* net saving addition shown under any of Feldstein's five Social Security proposals, is $30 billion per annum — almost 1 1/2 percent of the average 1977-81 gross national product assumed in Table 1. One interpretation of this magnitude is that, if these four proposals were implemented and all other assumptions underlying the 1977-81 forecast remained unchanged, then the average share of gross national product devoted to investment in plant and equipment during these years would be somewhere in the 11 1/2-13 percent range, instead of 11 1/2 percent as shown in Table 1. As long as both the economy's saving schedule and its investment schedule were neither perfectly elastic nor perfectly inelastic, the $30 billion outward shift of the saving schedule would lead not only to a decline in (inflation-adjusted) interest rates but also to a less-than-$30 billion per annum increase in the average ex post outcome for investment. The respective magnitudes of the interest rate decline and the investment increase would depend in turn on the elasticities of the saving and investment schedules. Perhaps a reasonable estimate, based on the factors discussed in Section I, is that the average outcome for investment would be in the neighborhood of 12 1/4-12 1/2 percent of gross national product.[31]

A different way to interpret this $30 billion per annum sum of the net saving addition for each of the four pension categories is to focus instead on the assumptions underlying the 1977-81 forecast summarized in Table 1. One of these assumptions, for example, is that the Federal Government (inclusive of the proposed increments to the several pension trusts) will run a balanced budget on average during this period. If these proposals for increased pension funding were to shift the private economy's saving schedule by an average of $30 billion per annum, then, other factors held equal, the Federal Government could on average run a budget deficit well

[30]This alternative calculation assumes that all Social Security employers are corporations taxable at 48 percent. It therefore slightly overstates the differences between the two assumptions about dividend behavior.

[31]In a full general equilibrium calculation, this additional investment would in turn presumably lead to an increase in gross national product with subsequent implications for greater income and saving totals, etc. The conditional 3.7 percent real growth forecast for 1977-81, which underlies the saving and investment flows indicated in Table 1, is as much a conclusion of the analysis in Friedman [18] as it is an assumption.

in excess of the 1970-74 average 1 percent of gross national product without interfering with the economy's ability to devote 11 1/2 percent of gross national product to private fixed investment.

Hence the positive implications of these pension funding proposals, for financing investment in plant and equipment, are of substantial magnitude even for the smallest of Feldstein's Social Security proposals. At the opposite end of the scale, including the largest of Feldstein's proposals, the sum of the net saving additions for each of the four categories is $66 billion per annum — nearly 3 percent of the average 1977-81 gross national product assumed in Table 1. This sum, which is almost two-thirds of the average personal saving flow shown in Table 1, is simply too astoundingly large to be politically feasible without a major rethinking of the form in which U.S. citizens will hold the Nation's wealth.

Over half of this $66 billion, for example, would represent added saving through Social Security for purposes of eventually accumulating a fund of securities which would exceed one year's total economic output. Feldstein introduced his proposals for such a Social Security fund by suggesting that the fund would invest only in existing government securities, but, unless the government embarks on an unprecedented era of sustained deficit financing, not enough government securities would exist to satisfy the fund's requirements. The $552 billion of U.S. Government securities (including obligations of the sponsored credit agencies) which were outstanding at the end of 1975 amounted to just over one-third of 1975 gross national product, and an annual deficit in the future equal to one-third of the annual increase of gross national product — according to the assumptions of Table 1, an average annual deficit of $65 billion during 1977-81 — would merely hold this ratio fixed. Furthermore, as Table 3 shows, at yearend 1975 ratios for other securities it would be impossible to assemble a fund of securities equal to a year's gross national product without having the fund hold most of the equity interest in the Nation's private-sector businesses. Proposals of this magnitude therefore seem far removed from reality except in the context of a broader conception of "pension fund socialism,"[32] in which case much of the analytical apparatus used in this paper could well be of little relevance anyway.

In sum, Munnell's and Connolly's proposals and the *smallest* of Feldstein's proposals for increased public pension funding add up to a magnitude which would be highly significant from the standpoint of U.S. capital formation in the medium-run future, and Feldstein's largest proposal would more than double this amount. Implementation of these proposals would alleviate substantially, if not overcome entirely, the likely overall scarcity of financial capital during the next half decade.

[32]See Lundberg [27] for a thoughtful analysis of an evolution along these lines which is now taking place, by design, in Sweden. Drucker [12], among others, has raised similar questions about the United States. See also Soldofsky [33].

IV. Public Pension Funding and the Relative Scarcity of Long-Term Capital

Wholly apart from their effect on the economy's aggregate saving schedule, the Munnell-Connolly and Feldstein proposals, if implemented, could also have a substantial impact on U.S. capital formation by changing the *composition* of the economy's saving. In particular as Section II explains, the increasing relative scarcity of long-term capital during the medium-run future is, in the absence of an unanticipated change in some underlying determinant of financial market behavior, likely to retard business fixed investment as much as or more than the overall scarcity of financial capital will. By changing the form in which the economy saves, these pension funding proposals could also shift the aggregate asset-preference characteristics of the U.S. financial markets toward a greater preference for long-term assets, thereby alleviating or eliminating this tendency toward increasing relative scarcity of long-term capital.

A Quantitative Perspective. In my earlier paper [18] I estimated that the balance of saving and investment shown in Table 1 for 1977-81 would be consistent with an average per annum total of $325 billion of net funds raised in the U.S. credit markets during this period. Of this $325 billion annual flow, $271 billion would represent net funds raised by all nonfinancial sectors of the economy, including $115 billion raised by nonfinancial corporate businesses.[33] Table 4, also drawn from that paper, indicates the corresponding amounts of net funds likely to be advanced by the various investing sectors of the U.S. credit markets on average during 1977-81. It is a reflection of the great extent of intermediation in the U.S. financial markets that, of the average $325 billion per annum total net acquisition of credit market instruments, fully $263 billion is likely to represent the credit market lending of financial institutions. To facilitate comparisons Table 4 also provides historical data, again for five-year periods and again excluding 1975-76.

For the purposes of this discussion, the insurance-pension sector — including life and other insurance companies, as well as the pension funds of both private businesses and state and local governments — is of key importance. As Table 4 indicates, the net volume of credit which these institutions extend will indeed continue to grow. Nevertheless, as has already been the case to some extent during the early 1970s, total net credit extensions by these four groups of institutional investors are likely to increase less rapidly during 1977-81 (64 percent above the 1970-74 per annum average) than will the net funds raised by nonfinancial business corporations (102 percent above the 1970-74 per annum average). Furthermore, the magnitudes indicated in Table 4 are conditional forecasts for the intersections of the relevant supply and demand schedules, so that they already reflect some effect, especially on corporations' external fund raising, of both increasing overall capital scarcity and increasing relative scarcity of long-term capital.

[33]See Friedman [18], Table 3.

The contrast between the $56 billion per annum total net acquisition of credit market instruments by the insurance-pension sector during 1977-81 and the corresponding $17 billion per annum for the household sector reflects individuals' preferences for holding depositary assets which Table 4, following the Federal Reserve System's Flow of Funds accounts, does not include as "credit market instruments."[34] Table 5 emphasizes this key contrast in asset preferences by showing the average net financial asset accumulations of households and of state and local government pension funds during the past ten years.[35] While households have invested only about one-tenth of their net financial asset accumulation in long-term credit instruments, state and local government pension funds have invested in virtually nothing else.

Because of this stark difference in asset preferences between pension funds and households, it is clear that implementation of the Munnell-Connolly and Feldstein proposals for increased pension contributions would have important effects even if (contrary to the assumptions in Section III) these extra contributions were ultimately to come entirely out of voluntary personal saving. The proposals' net effect in that case would be to increase the net asset accumulations of all pension funds and to reduce by an equal amount the net asset accumulation of the household sector (and, for the Social Security proposals as analyzed in Section III, to increase the borrowing of businesses). Given the different portfolio preferences between short- and long-term maturities shown in Table 5, this shift of saving form would increase the supply of long-term capital to the credit markets.

Table 6 shows the 1976 and 1981 yearend financial asset holdings of the four categories of public pension funds expected under current legislative arrangements, together with the average per annum accumulations (flows) implied for 1977-81.[36] Table 7 shows the corresponding 1981 yearend financial asset holdings and the implied 1977-81 average per annum

[34]Even so, a record $17 billion per annum average net acquisition of credit market instruments by households would represent a substantial shift away from deposits. Note that individuals constitute only about 85 percent of the household sector; non-profit organizations and bank-managed personal trusts account for the other 15 percent.

[35]Households' accumulation of financial assets here excludes life insurance and pension fund reserves.

[36]The civil service, military, and state and local government estimates are Munnell's and Connolly's. The Social Security estimate is the "medium assumption" estimate in Board of Trustees [3]; the alternative estimates for yearend 1981 under "optimistic" and "pessimistic" assumptions, are $30.3 billion and -$1.4 billion, respectively. It is worth noting that Munnell's and Connolly's $15.1 billion per annum estimate for the total financial asset accumulation of state and local government pension funds (including deposits) is not dissimilar to my own prior estimate of $13.5 billion per annum for these funds' net acquisitions of credit market instruments (excluding deposits) as shown in Table 4.

accumulations indicated by the provisions of the various Munnell-Connolly and Feldstein proposals.[37] Table 7 also shows the difference which each proposal would make for the annual accumulation flows, in comparison with those expected under current legislation.[38]

As a comparison with Table 4 indicates, the incremental pension fund asset accumulations shown in Table 7 are sizable in comparison with current prospects for the U.S. credit markets. Again including only the *smallest* of Feldstein's five Social Security proposals, the sum of these differences for the four categories of public pensions is $36 billion. If state and local government pension funds were to invest their $20 billion per annum accumulation according to their asset preferences of the past ten years as shown in Table 5, and if the other three categories of public pension funds were to exhibit similar portfolio behavior, most of this $36 billion annual flow would constitute additional net acquisitions of credit market instruments — especially long-term instruments. This $36 billion per annum would increase by almost two-thirds the net credit market lending of the combined insurance-pension sector.

On the extreme assumption that reduced accumulation of financial assets by households would fully match this $36 billion per annum added accumulation by pension funds, the primary initial effect would be to reduce households' accumulation of deposits (especially time deposits).[39] The further result would be to reduce thrift institutions' net extensions of mortgage credit and the growth of commercial bank credit, including both bank loans and short-term securities holdings.[40] Except for the effect on mortgage lending — which the federally sponsored credit agencies could presumably offset — the net effect of these shifts would be to increase the supply of long-term credit market funds to corporate businesses, and to reduce the supplies of other kinds of funds. This shift in the *composition* of the economy's preferred asset accumulation would therefore act to reduce the relative scarcity of long-term investment capital.

A Simulation Model. By how much would such a shift due to increased pension funding lower the cost of long-term investment capital to corporate businesses?

[37]Because Munnell and Connolly performed their calculations on the assumption of implementation of their proposals as of the beginning of 1975, the 1975 yearend asset totals underlying the accumulation flows shown in Table 7 for civil service, military and state and local governments are all slightly greater than the corresponding totals shown in Table 6.

[38]These differences are not equivalent to the net saving additions shown in Table 2, since they include interest and dividends earned on accumulated assets, and (in the case of military and Social Security) they exclude payments which the Federal Government would be contributing to make up any year's deficiency from benefits to be paid.

[39]As of yearend 1975, households' time deposits were nearly five times greater than their combined demand deposits and currency.

[40]The ultimate effect on bank credit of the shift in households' demand schedule for commercial bank deposits would depend not only upon the increasing business deposit demand associated with increased investment but also upon the particular monetary policy assumption made.

The familiar term-structure approach to modeling long-run interest rate determination is not capable of addressing this question. According to the conventional term-structure model, the (nominal) yield on a long-term security differs from the (nominal) yield on a closely substitutable short-term security according to expectations of the future short-term yield and, perhaps, some "liquidity premium" reflecting the less-than-perfect substitutability between the two assets. Once the current and expected future values of the short-term interest rate are given, the usual term-structure model admits little variation of the long-term interest rate. Since it assumes that different securities are highly substitutable — that is, that financial capital is virtually homogeneous — the term-structure model is not well equipped to deal with the notion of shifting relative scarcities within the overall capital market.

The prevailing empirical methodology of the term-structure approach is a model consisting of a single *unrestricted* reduced-form equation with the nominal long-term interest rate as the dependent variable. One assumption implied by the use of this methodology is that the way in which participants in the market for long-term securities, either individually or in the aggregate, adjust their actions in that market in response to any or all of the determinants of portfolio behavior does not matter for the ex post outcome for the long-term interest rate. In particular, this assumption implies that the quantities of long-term securities bought or sold, either by individual transactors or for the market in aggregate, do not influence the ex post outcome for the long-term interest rate. A few researchers have suggested relaxing this assumption somewhat by incorporating exogenous supplies of long-term securities directly as a determinant of the long/short spread, but they have done so within the familiar unrestricted reduced-form methodology of the term-structure approach, and their empirical findings along these lines have been modest at best.[41] Similarly, the strong asset-substitutability assumptions of the term-structure model leave little room for even a sizable shift of asset accumulations, from investors with one "preferred habitat" to investors with different asset preferences, to influence the long-term interest rate for a given short-term interest rate.

In a series of previous papers [17, 21, 22] I have developed a structural model of long-term interest rate determination which drops this restrictive asset-substitutability (capital-homogeneity) assumption and focuses directly on the demand for and supply of long-term bonds. In particular, this model specifies equations directly representing the portfolio behavior of bond market participants, including both bond issuers and bond investors. The addition of a market-clearing constraint, equating the

[41]See especially Modigliani and Sutch [28]. "Preferred habitats," which are the essence of the argument outlined both here and in Modigliani's and Sutch's descriptive analysis, are not successfully captured in their empirical work which relies entirely on unrestircted reduced-form estimation. In this context it is interesting to note Ando's and Modigliani's [1] subsequent rejection of unrestricted reduced-form methods.

sum of the demands of long-term debt securities to the sum of the supplies of long-term debt securities, enables the structural model to determine the long-term interest rate (i.e., the own-rate) which appears as a right-hand-side variable in each structural demand or supply equation for long-term bonds. (Since the long-term interest rate is clearly a jointly determined variable in this model, along with the demand and supply variables, it is necessary to use estimation techniques which avoid inconsistencies to which ordinary least-squares procedures would be subject because of the nature of the model's simultaneity.)

The complete structural model, including the market-clearing constraint, therefore constitutes an alternative to the single unrestricted reduced-form term-structure equation. The structural model's implied expression for the long-term bond yield is (except for the model's nonlinearity) a reduced-form equation which is equivalent to the conventional term-structure equation except that it is *restricted* by the underlying structural supply and demand equations.

Hence the key methodological difference between the structural approach and the more familiar term-structure approach to long-term interest rate determination is essentially equivalent to the distinction between *restricted* and *unrestricted* estimation. The two corrollary advantages of the structural approach are its ability to use the theory of portfolio behavior to constrain the implied equation for the long-term interest rate, and the facility which it provides for directly investigating hypotheses about portfolio behavior. In return, the structural approach imposes upon the researcher the discipline of explicitly acknowledging that, since bond yields (i.e., bond prices) are proximately determined in a market in which bonds are bought and sold,[42] any factor hypothesized to influence the bond yield must do so by influencing some issuer's supply of bonds or some investor's demand for bonds (or both). To the extent that expectations of future short-term yields are relevant via substitution effects which enforce the term-structure relationship, to the extent that less-than-infinite elasticities of substitution create "preferred habitats" which render quantity variables relevant, to the extent that less-than-infinite adjustment speeds render quantity flow variables relevant as well as quantity stock variables — in the structural model all of these factors affect the determination of long-term interest rates by (and only by) influencing the portfolio behavior of borrowers and lenders.

The structural approach also largely avoids the problem of spurious correlations inherent in unrestricted estimation of interest rate relationships. This point is especially relevant in the case of flexible distribution lags on past interest rates, which are typically the heart of term-structure equations and which are also arguments of the individual bond supply and demand equations in the structural model.

[42]The concept of the bond yield's being "proximately determined" in the bond market is not inconsistent with the principle of general equilibrium in the asset markets (see, for example, Tobin [34]) or for the economy as a whole (see, for example, Grossman [23]).

The demand side of this structural model of the bond market consists of six equations representing the net purchases of corporate bonds by life insurance companies, other insurance companies, private pension funds, state and local government pension funds, mutual savings banks and households. The specification of each of these six demand-for-bonds equations combines a model of the selection of equilibrium, as developed in an earlier paper [21]. The motivation for the optimal marginal adjustment model is to distinguish the reallocation of existing assets from the allocation of new wealth flows, because of the differential pecuniary and non-pecuniary costs associated with these two kinds of transactions. Since transactions costs leading to less-than-infinite adjustment speeds are at the heart of the distinction between flow-equilibrium "loanable funds" models and stock-equilibrium "liquidity preference" models of asset markets, the effort to deal as explicitly as possible with these differential adjustment speeds seems essential to the use of a flow-equilibrium model of interest rate determination. In addition, it enables the model to focus directly on the effects of proposals, such as those suggested by Munnell and Connolly and by Feldstein, which change patterns of financial flows and wealth accumulation.[43]

The supply side of the bond market model consists of two equations representing the net new issues of corporate bonds by domestic nonfinancial business corporations and finance companies. The specification of these two supply-of-bonds equations is analogous to that of the model's demand-for-bonds equations, combining the selection of equilibrium liabilities and the optimal marginal adjustment model.[44]

The model's ninth equation is a flow-equilibrium market-clearing identity which determines the nominal long-term interest rate. By construction of least-squares estimators, it follows that the unrestricted reduced-form equation estimated directly, as in the term-structure approach, will always "fit" historical interest rate data at least as well as the restricted expression estimated implicitly via the structural model. Hence it is possible that the structural approach may buy its key associated advantages — its ability to test explicit behavioral hypotheses and to investigate structural changes such as those suggested by Munnell-Connolly and Feldstein — at great cost in terms of performance as measured by historical fit. As the results presented in two earlier papers [21, 22] indicate, however, the sacrifice of empirical performance required by the structural approach is extremely minor. In a dynamic simulation of the model, based on U.S. quarterly data for 1960:I - 1973:IV, the root-mean-square simulation error for the particular long-term interest rate determined in this model (the Aa utility new-issue yield) is only 0.21 percent or 21 basis points — a result which compares favorably with the historical

[43]For reference on the demand side of this model, see in particular Friedman [21].

[44]The results for the two estimated supply equations corroborate the liability-preference arguments in Section II. For reference on the supply side of the model, see Friedman [22].

fit achieved by other researchers who have estimated unrestricted reduced-form term-structure equations to track less volatile long-term yield series over less volatile sample periods.

For several reasons, therefore, this structural model of the bond market is a useful tool for partial equilibrium analysis of the potential implications for the relative scarcity of long-term capital of implementing the Munnell-Connolly and Feldstein proposals for increased pension funding. First, the structural approach to long-term interest rate determination explicitly acknowledges the relevant heterogeneity of capital. Secondly, the model's level of disaggregation focuses explicitly on the different respective "preferred habitats" of households and pension funds. Thirdly, the specification of the equations describing these investor groups' demands for bonds incorporates an explicit role for the financial flow variables which the Munnell-Connolly and Feldstein proposals would alter in the first instance. Finally, the model's empirical performance in dynamic simulation tests has shown that it is at least capable of tracking closely the past history of long-term interest rate movements, despite its explicit avoidance of the potentially spurious correlations inherent in term-structure equations.[45]

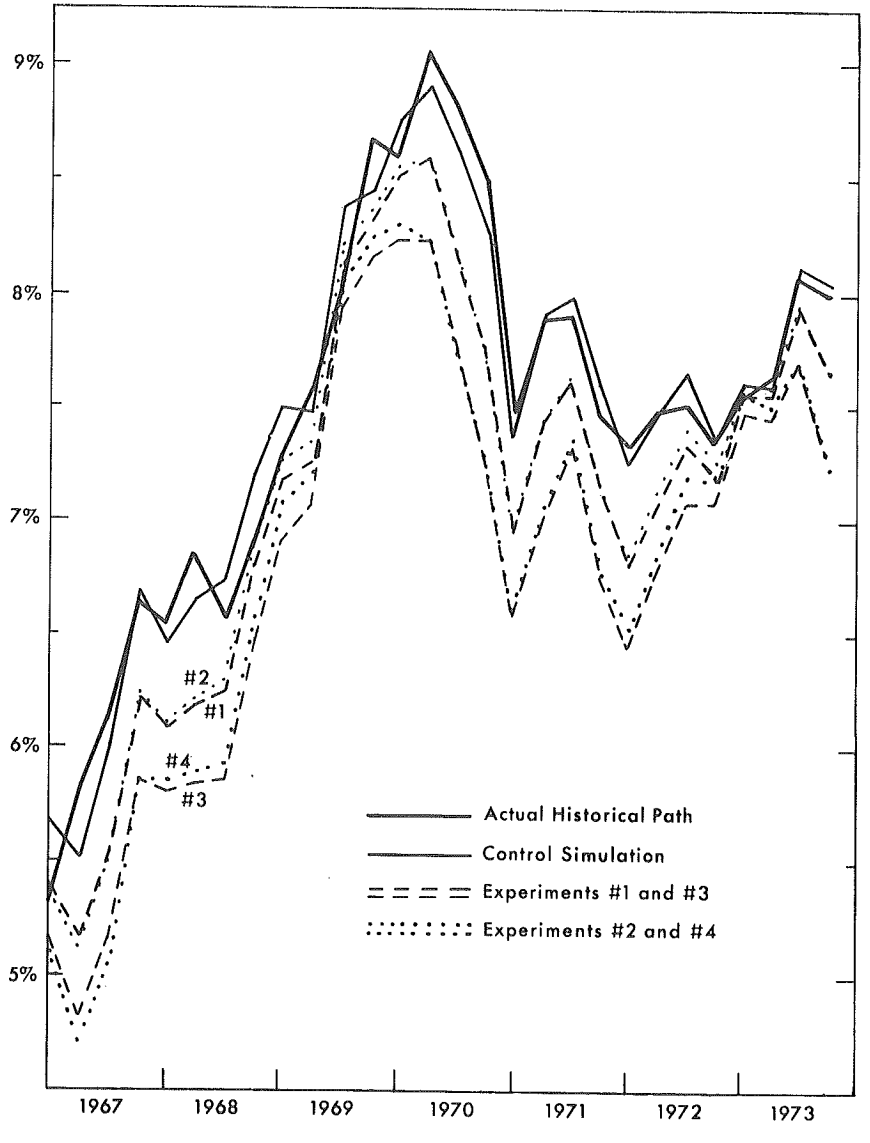
Simulations for 1967-73. Figure 1 and Table 8 summarize several simulations of the structural model of the bond market designed to investigate, albeit in a somewhat limited partial equilibrium context, the effects of the Munnell-Connolly and Feldstein proposals. The heavy solid line in Figure 1 plots the observed historical values of of the Aa new-issue long-term utility bond yield, and the light solid line plots the simulated values of this yield from the dynamic simulation reported in my earlier paper [22], based on historical values for all exogenous variables. The first two lines of Table 8 indicate that the mean simulated value of 7.48 percent during 1967-73 is virtually identical to the mean actual value during this period.

The first simulation experiment attempts to capture the effects which would have followed from introducing the Munnell-Connolly proposal for increased contributions to state and local government pension funds, on the assumption that household financial asset accumulation would *not* have offset the added asset accumulation of the pension funds. The assumption, therefore, is that the proposal not only would have altered the *composition* of the economy's saving but would have increased *total* saving as well. Implementation of this experiment consists of rerunning the

[45] A comprehensive flow-of-funds model, such as that developed by Bosworth and Duesenberry [7] and Hendershott and Lemmon [24], would in principle be a better vehicle for evaluating these proposals, since such a model would at least admit a general equilibrium treatment of all asset markets. See Friedman [21, 22], however, for criticisms of these models. As the discussion below indicates, a full general equilibrium model, incorporating the nonfinancial economy as well as all asset markets, would be necessary to undertake a complete analysis of these proposals' implications for capital formation.

Figure 1

DYNAMIC SIMULATION RESULTS
FOR Aa UTILITY NEW ISSUE YIELD, 1967-73



historical simulation for 1960-73, but with the net accumulation of financial assets by state and local government pension funds increased by an extra $2.1 billion in each quarter beginning with 1967:I. This $2.1 billion per quarter (or $8.4 billion per annum) addition is 1.3 times state and local government pension funds' actual historical average $6.5 billion per annum financial asset accumulation during 1967-73, just as the $19.8 billion per annum additional accumulation by these funds implied by Munnell's proposal for 1977-81 (see again Table 7) is 1.3 times the corresponding $15.1 billion per annum accumulation expected for 1977-81 under current legislation. The simulation experiment assumes that all other variables influencing the long-term bond yield — including, for example, short-term yields and business investment in plant and equipment — remain unchanged at their historical values.

The broken line marked No. 1 in Figure 1 plots the values of the long-term interest rate which result from this simulation experiment. The additional demand for bonds by state and local government retirement funds immediately drives the simulated bond yield below the corresponding actual historical path and keeps it below the historical path through the end of the simulation. As the third line of Table 8 indicates, the average simulated reduction of the bond yield during 1967-73 is 0.34 percent. Since this partial equilibrium experiment analyzes the level of the long-term interest rate for a given value of the short-term interest rate, it is most useful to regard this result as a reduction in the average slope of the yield curve (the term-structure of interest rates) by 0.34 percent.

The second simulation experiment again focuses only on the Munnell-Connolly proposal for state and local government pension funds but, in contrast to the first experiment, assumes that reduced financial asset accumulation by households would have matched exactly the increased asset accumulation by these funds. Hence the assumption underlying this experiment is that implementation of this proposal would have altered only the *composition* of the economy's saving, *without* having increased the *total.* In addition to increasing state and local government pension funds' asset accumulation by $2.1 billion per quarter above the actual historical values, therefore, implementation of this experiment also involves reducing households' asset accumulation by $2.1 billion per quarter below the actual historical values.

As the dotted line marked No. 2 in Figure 1 and the fourth line of Table 8 indicate, nearly all of the long-term interest rate reduction associated with Munnell's and Connolly's proposal in the first experiment (0.31 percent out of 0.34 percent) remains in the second, despite the assumption of no increase in the economy's total saving. The shift in the composition of saving among investors with different "preferred habitats," which is responsible for *all* of the long-term interest rate reduction in the second experiment, apparently accounts for *almost all* of the corresponding reduction in the first experiment. Once again, it is important to recall the assumption of unchanged short-term interest rates underlying

this partial equilibrium analysis of the bond market. In this second experiment, in which households' net asset accumulation declines, the reduced demand for deposits and other short-term assets would, in a more general equilibrium analysis of the asset markets, cause short-term interest rates to rise. What remains almost unchanged from the first experiment, therefore, is not the impact on the level of the long-term interest rate but rather the impact on the yield "spread" between the long and short ends of the maturity spectrum.

The third and fourth simulation experiments are analogous to the first and second, respectively, except that the financial asset accumulation adjustment is $3.9 billion per quarter instead of $2.1 billion per quarter. This greater adjustment reflects the 1967-73 equivalent of implementing Munnell's and Connolly's proposals for civil service, military, and state and local government retirement funds, and the *smallest* of Feldstein's five proposals for Social Security, on the assumption that the portfolio behavior of the civil service, military and Social Security funds — two of which would have grown rapidly under the respective proposals — would have been the same as that observed historically for state and local government retirement funds.[46] The results of these two experiments, as indicated by Figure 1 and Table 8, are roughly similar to the first two sets of results, only greater in magnitude as is to be expected. Again, from the standpoint of the slope of the yield curve, the major substantive result is that the "preferred habitat" effect is what matters most, with only minimal effects depending on the increase in total financial asset accumulation. Since the level of short-term interest rates would presumably differ between the two experiments, however, the absolute level of the long-term interest rate would depend also on the increase in total asset accumulation.

There are at least two important biases — one upward and one downward — inherent in these partial equilibrium experiments' simulated values of the long-term bond yield.[47] The upward bias, which is present especially in experiments No. 1 and No. 3, is that these simulations hold fixed, at the historical values, the yields not just on short-term assets but on all competing financial instruments. Since an increase in the economy's total saving would presumably lower all yeilds, and a shift in the composition of saving toward investors preferring long-term assets would presumably lower the yields on those assets which are most closely substitutable with corporate bonds, these simulations probably overstate the

[46]It is worth noting explicitly that this assumption contradicts not only the limited historical experience thus far with management of Federal pension trusts but also Feldstein's declared intention of having the Social Security fund invest only in government securities -- hence the motivation for examining the state and local government pension proposals separately, as in experiments No. 1 and No. 2. Nevertheless, it is not altogether implausible that, once confronted with asset accumulations of the magnitudes proposed by Munnell and Connolly and by Feldstein, Federal pension trust managers would adopt investment policies more comparable to those historically followed by state and local governments.

[47]See again footnote 45.

effect of the various proposals in inducing investors to substitute other assets for bonds. This collective bias in the individual supply-of-bonds and demand-for-bonds equations — which stems from the use of a partial equilibrium analysis of the bond market, rather than a general equilibrium analysis of all asset markets together — in turn results in an upward bias for the simulated path of the bond yield. The corresponding downward bias — which stems from not using a general equilibrium model of the nonfinancial economy, as well as all asset markets — follows from holding fixed, at the historical values, nonfinancial corporations' investment in plant and equipment. If nonfinancial corporations responded to the induced interest rate reduction by undertaking more investment in plant and equipment, then not only would their net external deficit be greater (thereby increasing their supply of bonds) but also, according to the relevant supply equation in the model, the fraction of any given external deficit which they would seek to finance by issuing bonds would be greater. Furthermore, going on to allow for the effects of greater investment in stimulating economic activity would presumably uncover yet a further related source of downward bias in the absence of an assumption about monetary policy accommodating the resulting additional demand for money.

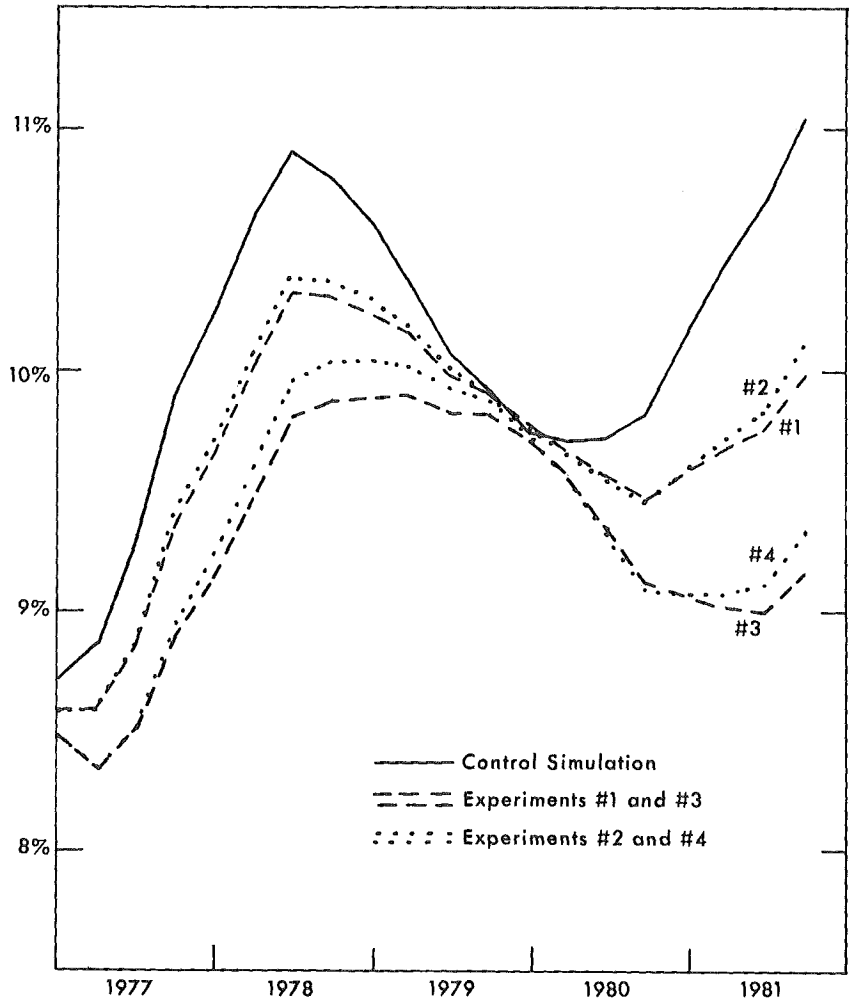
To what extent these two sets of biases are offsetting, and to what extent other biases also exist in these simulation experiments, probably constitute unanswerable questions. Considerable caution is appropriate, therefore, in evaluating the numerical results of these experiments. Even without attribution of undue precision to them, however, these experiments do indicate that the Munnell-Connolly and Feldstein proposals, had they been implemented in the past, would have had a substantial impact on the relative scarcity of long-term capital — that is, on the term-structure of interest rates — primarily because of their effect in shifting asset accumulations from households with their short-term "preferred habitat" to pension funds with their long-term "preferred habitat."

Simulations for 1977-81. Figure 2 and Table 9 summarize several simulation experiments designed to investigate the implications of the Munnell-Connolly and Feldstein proposals directly within the context of the 1977-81 period. As far as possible, these experiments use directly the credit market and national income flow quantities indicated for 1977-81 in the tables in my earlier paper [18].[48] The structural model of the bond market also uses as exogenous variables a number of yields on alternative financial instruments, and these experiments simply assume that these yields remain constant at their recent (1976:II) levels throughout 1977-81. The solid line in Figure 2 plots the values of the long-term bond yield generated by a "control" simulation based on these assumptions.

[48]The net acquisitions of financial assets by households and life insurance companies are somewhat different; see Friedman [21].

Figure 2

DYNAMIC SIMULATION RESULTS
FOR Aa UTILITY NEW ISSUE YIELD, 1977-81



The control simulation's 10.08 percent average for the bond yield during the entire 1977-81 period is relatively high, given the assumed continuation of the recent low level of short-term interest rates, and the steepness of the implied yield curve reflects the relative scarcity of long-term capital discussed in Section II. Nevertheless, it is essential to emphasize that the object of this control simulation is *not* to imply a forecast of the bond yield. Its purpose is, instead, to provide a base for comparisons, so as to facilitate performing in the 1977-81 context the dynamic simulation experiments described above for 1967-73. The proper focus of attention is therefore the bond yield *difference* between each simulation experiment and the corresponding control — not the particular path of the bond yield in the control simulation per se.

The first and second 1977-81 simulation experiments are analogous to those for 1967-73 as described above. In particular, they assume the implementation, as of the beginning of 1977, of Munnell's and Connolly's proposal for increased contributions to state and local government pension funds, first under the assumption of no offsetting fall in households' financial asset accumulation and then under the assumption of *full* offset. The appropriate asset accumulation adjustment in these two experiments is $5.0 billion per quarter (one-fourth of the $19.8 billion per annum shown in Table 7).

The third and fourth 1977-81 simulation experiments are again analogous to those described above for 1967-73. They assume the implementation, as of the beginning of 1977, of all three of the Munnell-Connolly proposals and of the *smallest* of Feldstein's five proposals, again under the same two alternative assumptions about households' financial asset accumulation. The appropriate asset accumulation adjustment in these two experiments is $9.0 billion per quarter (one-fourth of the $36.0 billion per annum total from Table 7).

The results of these four experiments — which are conditional on the same underlying assumptions and are therefore subject to the same biases discussed above in the context of the 1967-73 experiments (and presumably, because of their future orientation, to many more errors besides) — again suggest that implementing the Munnell-Connolly and Feldstein pension funding proposals would substantially offset, if not entirely eliminate, the increase in the relative scarcity of long-term financial capital described in Section II. Once again, while the effect on the absolute level of the long-term interest rate would presumably depend on the increase in total financial asset accumulation, it is the shift among different investors with different "preferred habitats" which produces almost all of the reduction in the slope of the yield curve.

V. Summary and Conclusions

The background underlying this paper is the concern that, in the absence of public-policy initiatives, financial scarcities during the next five to

ten years may impair the U.S. economy's ability to achieve a capital formation rate adequate for the purposes of a number of widely recognized economic objectives. One source of this problem, if it in fact materializes, is likely to be an increasing overall scarcity of financial capital. A second source of this problem — perhaps a more important one — is likely to be an increasing relative scarcity of long-term capital.

This paper's analysis of Munnell's and Connolly's proposals for increased funding of civil service, military and state and local government pensions and Feldstein's proposals for increased funding of the Social Security system yields two primary conclusions in this context:

First, implementation of Munnell's and Connolly's three proposals, together with even the smallest of Feldstein's proposals, would substantially increase the economy's total saving. This outward shift of the economy's saving schedule would probably be of a magnitude sufficient to offset much or all of the anticipated increasing overall scarcity of financial capital. A good estimate is that it would add about an extra 1 percent to the share of U.S. gross national product devoted to fixed investment in plant and equipment in the medium run.

Secondly, wholly apart from any effect of increasing the economy's total saving, implementation of these proposals would also substantially alter the asset preference characteristics of the investor side of the U.S. credit markets. In particular, by shifting asset accumulations from households to pension funds, implementation of these proposals would increase the economy's total demand for long-term assets, thereby offsetting much or all of the increasing relative scarcity of long-term capital. A good estimate is that this shift of asset preferences would reduce the average yield-curve "spread" between long-term and short-term financial instruments by about 0.50 percent or 50 basis points. This resulting reduced scarcity of long-term capital would further facilitate U.S. physical capital formation in the medium run.

Table 1

GROSS SAVING AND INVESTMENT: HISTORICAL AND CONDITIONAL FORECAST

Average Annual Flows (Percent of GNP)	1960-64	1965-69	1970-74	1977-81
Gross Private Saving	15.4%	15.9%	15.8%	15.7%
Personal Saving	3.8	4.5	5.5	4.9
Undistributed Corporate Profits	2.8	3.1	2.8	3.1
Inventory Valuation Adjustment	— 0.0	— 0.3	— 1.2	— 0.9
Capital Consumption Allowances	8.8	8.7	8.7	8.6
U.S. Government Surplus	— 0.2	— 0.2	— 1.1	0.0
State & Local Government Surplus	0.1	0.0	0.5	— 0.1
Statistical Discrepancy	— 0.1	— 0.3	— 0.3	— 0.1
Gross Investment	15.2	15.4	14.9	15.5
Gross Private Domestic Investment	14.6	15.2	15.1	15.8
Plant and Equipment	9.3	10.5	10.3	11.5
Residential Construction	4.5	3.5	3.9	3.5
Inventory Accumulation	0.8	1.2	0.8	0.8
Net Foreign Investment	0.6	0.2	— 0.2	— 0.3
Average Annual Flows (billions of current dollars)	**1960-64**	**1965-69**	**1970-74**	**1977-81**
Gross Private Saving	$ 86.5	$ 128.1	$ 185.5	$ 341.9
Personal Saving	21.2	35.9	64.1	106.7
Undistributed Corporate Profits	16.0	25.2	32.5	67.5
Inventory Valuation Adjustment	— 0.1	— 2.6	— 14.0	— 19.6
Capital Consumption Allowances	49.5	69.7	102.8	187.3
U.S. Government Surplus	— 1.3	— 1.9	— 13.0	0.0
State & Local Government Surplus	0.7	0.2	5.7	— 2.2
Statistical Discrepancy	— 0.6	— 2.7	— 3.4	— 2.2
Gross Investment	85.4	123.7	174.7	337.5
Gross Private Domestic Investment	82.1	122.2	177.6	344.1
Plant and Equipment	52.5	84.7	121.7	250.4
Residential Construction	25.0	28.0	46.5	76.2
Inventory Accumulation	4.7	9.5	9.4	17.4
Net Foreign Investment	3.2	1.5	— 2.9	— 6.5

Notes: Figures through 1974 are data from U.S. Department of Commerce.
Figures for 1977-81 are projections based on assumptions about growth of the economy, price inflation, Federal tax and expenditure policy, monetary policy, and other factors as explained in Friedman (18).
Detail may not add to totals because of rounding.

Table 2

SAVING SCHEDULE SHIFTS FOR PUBLIC PENSION FUNDING PROPOSALS

	1977-81 Average Payroll (billions)	Increase in Contribution Percentage	1977-81 Average Net Addition In Saving (billions)
Civil Service	$ 53.8	5.4%	$ 2.7
Military	18.7	34.3	6.0
State & Local Governments	159.0	10.6	15.7
Social Security			
Bulge Only, Wage Indexing	1,004.4	2.8	26.2 (19.8)
Bulge Only, Price Indexing	1,004.4	0.55	5.1 (3.9)
GNP Fund, Wage Indexing	1,004.4	3.25	30.4 (23.0)
GNP, Price Indexing	1,004.4	1.0	9.3 (7.1)
Endowment Fund, Price Indexing	1,004.4	4.4	41.1 (31.2)

Note: $21.8 billion = 1 percent of 1977-81 average gross national product assumed in Table 1.

Table 3

SIZE OF SEVERAL KEY SECURITIES MARKETS

	1975 Yearend Outstandings (billions)	Percentage of 1975 GNP
U.S. Government Securities	$ 551.7	36.4%
State & Local Government Securities	230.5	15.2
Corporate Bonds	317.4	20.9
Corporate Equities	816.4	53.8
Total	1,916.0	126.4

Table 4

TOTAL NET ACQUISITIONS OF CREDIT MARKET INSTRUMENTS, BY LENDING SECTOR: HISTORICAL AND CONDITIONAL FORECAST

Average Annual Flows (billions of current dollars)	1960-64	1965-69	1970-74	1977-81
Total Net Acquisitions	$ 59.7	$ 97.0	$ 185.8	$ 325.0
By Domestic Financial Sectors	52.5	77.1	157.3	263.0
Life Insurance Companies	6.3	8.4	13.2	22.0
Other Insurance Companies	1.1	2.0	5.4	8.5
Private Pension Funds	4.1	5.7	7.3	12.0
State & Local Government Pension Funds	2.5	4.3	8.2	13.5
Mutual Savings Banks	2.8	3.7	6.7	10.0
Savings & Loan Associations	10.3	8.6	25.1	34.0
Federal Credit Agencies	1.2	3.9	12.9	24.5
Commercial Banks	16.6	26.3	57.7	104.5
Federal Reserve System	2.1	4.0	5.9	9.0
Finance Companies	3.0	4.3	5.9	13.5
Other Financial Institutions	2.4	5.7	9.0	11.5
By Nonfinancial Sectors	7.1	19.8	28.5	62.0
U.S. Government	1.8	4.0	3.5	6.5
State & Local Governments	0.5	2.7	1.2	2.0
Households	2.8	10.2	5.6	17.0
Corporate Nonfinancial Business	0.6	1.6	4.1	9.5
Other Nonfinancial Business	0.3	0.5	1.0	1.5
Foreign	1.0	0.8	13.1	25.5

Notes: Figures through 1974 are data from Board of Governors of the Federal Reserve System.
Figures for 1977-81 are projections based on assumptions about growth of the economy, price inflation, Federal tax and expenditure policy, monetary policy, and other factors as explained in Friedman (18).
Detail may not add to totals because of rounding.

Table 5

AVERAGE ANNUAL NET FINANCIAL ASSET ACCUMULATIONS OF HOUSEHOLDS AND OF STATE AND LOCAL GOVERNMENT PENSION FUNDS, 1965-75

	Households		Pension Funds	
	Amount (billions)	Percent	Amount (billions)	Percent
Deposits and Currency	$ 57.1	78.4%	$ 0.1	1.4%
Short-Term Credit Market Instruments	5.1	7.0	— 0.1	— 1.4
U.S. Government Securities	3.7	5.1	— 0.1	— 1.4
Other	1.4	1.9	0.0	0.0
Long-Term Credit Market Instruments	8.4	11.5	7.0	98.6
Equities	— 3.5	— 4.8	2.2	31.0
Corporate Bonds	5.2	7.1	4.3	60.6
Municipal Bonds	3.8	5.2	0.0	0.0
Mortgages	3.1	4.3	0.5	7.0
U.S. Government Securities	— 0.2	0.3	0.0	0.0
Other	2.4	3.3	0.0	0.0
Total	72.8	100.0	7.1	100.0

Note: Detail may not add to total because of rounding.

Table 6

PROJECTED PENSION FUND ASSET ACCUMULATIONS
UNDER CURRENT LEGISLATION
(Billions of Dollars)

	1976 Yearend Assets	1981 Yearend Assets	1977-81 Average Accumulation
Civil Service	$ 43.0	$ 77.6	$ 6.9
Military	0.0	0.0	0.0
State and Local Governments	110.3	186.0	15.1
Social Security	40.0	17.9	— 4.4

Table 7

PROJECTED PENSION FUND ASSET ACCUMULATIONS UNDER VARIOUS PROPOSALS
(Billions of Dollars)

	1981 Yearend Assets	1977-81 Average Accumulation	Difference from Current Legislation
Civil Service	$ 100.1	$ 10.6	$ 3.7
Military	44.8	7.7	7.7
State & Local Governments	299.0	34.9	19.8
Social Security			
Bulge Only, Wage Indexing	149.1	21.8	26.2
Bulge Only, Price Indexing	42.1	0.4	4.8
GNP Fund, Wage Indexing	171.2	26.2	30.6
GNP Fund, Price Indexing	64.2	4.8	9.2
Endowment Fund, Price Indexing	231.5	38.3	42.7

Note: $21.8 billion = 1 percent of 1977-81 average gross national product assumed in Table 1.

Table 8

LONG-TERM INTEREST RATE SIMULATIONS
FOR 1967-73

	1967-73 Average Yield	Difference from Control
Actual	7.46%	0.02%
Control Simulation	7.48	—
Experiment 1	7.14	0.34
Experiment 2	7.17	0.31
Experiment 3	6.84	0.64
Experiment 4	6.89	0.59

Table 9

LONG-TERM INTEREST RATE SIMULATIONS FOR 1977-81

	1977-81 Average Yield	Difference from Control
Control Simulation	10.08%	—
Experiment 1	9.67	0.41%
Experiment 2	9.70	0.38
Experiment 3	9.30	0.78
Experiment 4	9.36	0.72

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Discussion

Franco Modigliani*

This has been for me an exciting conference in that I have never heard the word life cycle mentioned so frequently and life-cycle concepts used so frequently as in this conference. To be sure, many of the people here, and notably Feldstein and Tobin, have much improved on my original contribution. In fact, Tobin sometimes accuses me of not really understanding what the life-cycle model is about, and Feldstein is too young and polite to quite do that, but I can see it in his eyes. I am not less pleased by the fact that the model underlying Friedman's paper is the most ambitious attempt so far at giving empirical embodiment to the "habitat" theory of the term structure of interest rates — and I do not really mind that he, too, feels he understands that theory far better than I.

Tobin has dealt extensively with the question of the effect of additional funding on national saving, and I do not really have very much to add to this issue. I think he has made some quite interesting additions to the list of reasons why additional funding of Social Security would not have its full effect in raising saving or, conversely, why a Social Security System not funded would not reduce the saving by the full amount of the promised retirement benefits.

The role of the liquidity constraints to which he referred could be of some importance, though it should be understood, in the context of the life-cycle model, that this liquidity constraint could merely have the effect of changing the pattern of consumption over the earning span. Specifically suppose that in the absence of Social Security, a household would have chosen not to save at the beginning of its life, postponing the saving until a later time when its income was expected to be higher. If a Social Security tax is now levied on his income, and because of capital market imperfections he is not able to borrow against future income, then, as Tobin points out, he will be forced to consume less, and total consumption will thereby be reduced. However, he will now be able to consume more than he would have otherwise later in life, when his income is higher. In steady state, these effects will tend to cancel out, as is clear from the consideration that, with a pay-as-you-go system, in which people rely entirely on Social Security for their retirement, the net accumulation will be zero, no matter what the age pattern of consumption.

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Before I move on to the impact of funding on financial markets, I would also like to raise an issue, that our discussion so far has failed to clarify, about why we should favor funding Federal Government retirement programs like military pensions. I can see a case for funding the liabilities accruing hereafter in order not to impose a burden on "future generations," but I can see no grounds for funding the accumulated liabilities any more than I can see merits in the proposition that it behooves the government to repay the national debt. To be sure, there might be circumstances when we might deem it appropriate to raise national saving through a budget surplus, but surely to do so we do not need the excuse that we should repay the outstanding debt!

Let me then come to some aspects of Friedman's results. It seems to me that two main things need to be discussed. One is to review briefly some of the assumptions he makes in trying to assess the implications of the various levies on various participants in society — the question of incidence. The other and more important item is to discuss his analysis of the effect of these additional flows from the funding of pensions on interest rates and financial markets. On the first point, I find myself in some disagreement with several of the assumptions he makes. He assumes that if there is an addition to the Social Security levy, it would all come out of corporate profits. Yet the evidence I have seen seems to suggest that these taxes are fully shifted onto real wages through the mechanism of prices being determined by a stable markup over direct costs. In other words, though half of Social Security taxes is levied on the employer, there is reason to believe that eventually even the half that is paid by the employer tends to be shifted onto higher prices, and therefore finally into lower real wages.

Because of this view, I perhaps need not spend much time on the next question, namely: Supposing it falls on profits, does it make a difference whether it is then absorbed into a reduction of dividends or a reduction of corporate savings? Ben seems to assume that if the reduction of profits falls on dividends, saving would be affected much less than if it fell on retained earnings. This is the traditional wisdom, but it ignores the effect of corporate saving on private saving. The purest life-cycle model suggests that, aside from differential tax treatment, changes in corporate savings are eventually totally offset by opposite changes in private saving. While this conclusion may not hold precisely, there is considerable evidence of at least a partial and substantial offset.

Now let me come to his model. I think that to understand his paper, we have to be aware of the fact that he had a model in his pocket, and was eagerly looking for some place where he could make good use of it. The paper for this conference gave him that opportunity, and he has made good use of it. To avoid the possibility that the reader might misinterpret the implications of his simulation, however, I want to reemphasize that his results must relate to the effect of funding, not on the level of long-term interest rates but instead on the slope of the yield curve.

Friedman is particularly impressed and pleased by his finding that the effect of funding on long-term rates is very nearly the same whether the additional flows accruing to pension funds are totally offset by a reduction in household saving — leaving the total saving rate unchanged — or whether, instead, they represent a net addition to total saving. In the latter case, interest rates do fall a little more, but only a little.

In my view, this rather striking conclusion must be taken with a good deal of skepticism simply because his partial equilibrium model is unsuited to provide a reliable estimate of the magnitude of the differential effect. Indeed, in his simulations he explicitly assumes that the aggregate investment of the corporate sector, and hence the aggregate amount of liabilities issued by this sector, is the same whether total saving rises or is instead unchanged and only rechannelled. This is obviously an untenable assumption for the problem on hand. If there is more saving, presumably some of it must end up as additional investment in the corporate sector; indeed, this is presumably the purpose of increased funding.

The above considerations are not meant to suggest, however, that Friedman's exercise and results are of little value. His model is really designed to analyze the effect of changes in the flows of savings on the term structure of interest rates, and notably on the spread between short- and long-term rates. His result, under the assumption of no change in aggregate saving, must, therefore, be understood as providing an indication of the effect, on the term structure, of reducing the flow of saving directly invested by households and increasing the flow of saving going through the pension funds. This effect, he concludes, is that of producing a very substantial decline in the spread, even though, for reasons suggested above, nothing much can be inferred about the level of either the short or the long rate. His second experiment, in which the total flow of saving is increased, would suggest that the effect on the spread would not be very different even though, presumably, in this case the downward effect at least on the long rate should be significant.

In this more limited context, his procedure and his results seem reasonable, though I can think of a few sources of bias in his procedure, which should be taken into account in evaluating the results. Consider first the case in which there is no change in saving. Because in his model he takes as exogenously given the flows of saving into all financial institutions other than pension funds themselves, the only effect of the reduction in household saving that he is able to take into consideration is the reduced direct purchases of long-term bonds and short-term instruments by households. Since households tend to invest very little directly in bonds, their reduction in bond purchases does rather little to offset the additional demand by pension funds. It is partly for this reason that he finds that a very large decrease in the spread is required in order to induce the other financial intermediaries to reduce their demand for long-term bonds, and financial corporations to increase their supply to the extent needed to satisfy the new pension funds' demand. However, if households save less and do not reduce very much their purchase of

bonds, then they must be reducing to a substantial extent their claims on insurance companies and mutual savings banks, who in turn are demanders of long-term instruments. If we took into account this decreased demand offsetting the increased demand by pension funds, then presumably the yield spread would be reduced less.

A further effect which is somewhat more complicated is that when mutual savings banks receive less deposits from households because households have less to invest, they may have less money to put into the mortgage market, even after allowing for their reduced acquisition of bonds. If that is the case, then the mortgage rate must rise, and that has a feedback on the bond rate. Part of the feedback, I believe, would be that the investment of the corporate sector would have to rise and therefore the level of the corporate rate would have to fall. This is because with the higher mortgage rate, there must be a reduction in investment in houses and since the total amount of investment is fixed, there must be more corporate investments.

Though I have certainly not exhausted the list of omitted channels, I would conjecture that the final result is something like: If there were a complete offset of the incremental technological flows, there would be a rise in the mortgage rate, and a reduction in housing, because those intermediaries that finance housing receive a smaller inflow. There would be some decline in the corporate bond rate to produce more absorption into corporate investment, and there would be a rise in the short term because of the reduced spread, though that reduction would be probably less than the 50-60 basis points suggested by Friedman's simulations.

When one comes to the second case in which there is also an increase in aggregate saving, the problem gets really quite complicated and risky to handle without the crutch of a complete model. But, clearly, if you start from this initial model and let the household have additional funds to invest, quite clearly a major effect of the whole operation must be a significant reduction of the corporate bond rate. There will also be a reduction of the mortgage rate since now the intermediaries have lost nothing and they are investing less in bonds to satisfy the additional demand of pension funds. So there must be more funds going both in the corporate sector and in housing, and one must end up with a lower long-term bond rate, and the effect on the spread will presumably also be smaller than in the first case. However, it is unclear whether, in the end, the short rate would rise or fall. It would tend to rise insofar as the spread is reduced, but it would tend to fall insofar as the long-term bond rate is declining, and Tobin's calculations suggest that you would have a very large decline in the bond rate.

However, I would like to raise some objections to Tobin's calculations in the sense that Tobin is assuming that we have the additional investment under conditions in which the underlying production function hasn't shifted. Some of what Friedman has been telling us is that there are reasons to believe that there has been a shift in the sense that somehow we are moving toward more capital-intensive investment and have created some additional demands which weren't there before. To this extent it could just be

— and I think that is what he has in mind — that this new capital coming to the market would prevent what would otherwise be a very large rise in interest rates. In other words, the depressing effect of additional saving on interest rates, suggested by the analysis of the previous paragraph, may just prevent them from rising as much as they would otherwise have risen.

Discussion

James Tobin*

I'd like to do three things in this discussion: first, I will offer some remarks about Ben Friedman's paper and his simulations. Second, I would like to discuss the part of the story Ben's paper doesn't deal with, what it would take to get the additional saving into additional investment. Third, I have some general comments which bear both on Ben's paper and on the background papers of which his is, in a sense, a continuation.

I think the great merit of the way Ben has put the problem before us is that it calls attention in a very concrete and quantitative manner to the magnitudes of annual additions to potential saving in the economy which would follow from the proposals we heard yesterday. What Friedman does is to estimate the change in long-term corporate bond rates which follow from putting more investable funds into pension fund portfolios. This is done, as Ben pointed out both in his paper and orally, on the assumption that other rates of interest and asset yields are unchanged. It is explicitly a partial analysis and a partial calculation. Ben has a very fine model of the corporate bond market. He doesn't have it plugged into a larger model. Lacking a complete model, he can't tell us what the full effects of throwing $38 or $78 billion of additional saving into the economy would be.

His main point is that pension funds are by nature big holders and buyers of long-term corporate bonds. Giving them more savings to invest is good for the price of those bonds. I am sure that's true.

He also assumes, rather mysteriously, that the funding or partial funding of the U.S. Social Security obligations and of civil service and military pensions would have the same effects on the demand for assets as placing additional funds at the disposal of state and local retirement funds. I didn't understand that because I thought the Federal funds would just acquire more U.S. Treasury securities. The effect on financial markets would be that correspondingly fewer Treasury issues would be outstanding. So I would have thought that the exogenous change for that experiment was a decline in the supply of Federal bonds. Now, it could be assumed — at least for the purpose of the exercise — that the reduced supply is at the long end of the Federal debt. That would have qualitatively the desirable impact that Ben is talking about, for presumably long bonds are the closest Treasury substitutes for corporate bonds.

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However, there is no guarantee that when the Treasury has the opportunity to place more of its debt with the pension funds and the Social Security funds, the debt managers will take advantage of that opportunity by issuing the public a smaller number of long-term bonds. They might issue a smaller number of short-term bills or notes, so that Friedman's twist operation would be frustrated. Presumably, there is a telephone between the Treasury and the rest of the government, and they could in principle arrange things to come out the way that Marty Feldstein picturesquely suggested the other day, namely that the funds simply buy back already existing bonds and no other Treasury debt operations are affected.

I am rather sensitive to this point. In the Kennedy years we persuaded the Federal Reserve to do a rather modest amount of buying back of long-term bonds from the public. But the Treasury proceeded to issue even more long-term bonds than they had before.

Anyway, maybe the Treasury operations would have the same effect as the behavior Friedman assumed when he did the experiments and estimates *as if* all the new saving, Federal, state and local, went into the hands of managers who have portfolio preferences for state and local retirement funds.

Friedman's presumption is that there is a particular shortage of long-term fixed-money-value finance, a scarcity of corporate bond finance. I'm not sure. I think there is also an equity finance problem that may be even more acute. In the hypothetical 1977-1981 era, Friedman takes us by assumption out of the present morass. So presumably equity markets are not as bad as they have been. Given the already rather large amount of long-term bond debt with which corporations have saddled themselves, I would expect them to turn more to equity. This could be done either by direct issues in equity markets or indirectly by retention of earnings, possibly just by raising dividends less rapidly. It is not clear in Ben's simulations what is really happening to the true market cost of capital relevant for investment decisions. He is talking only about part of that cost, namely the bond rate. The cost of capital has another component, the equity yield implicit in the stock market. I take it that in Ben's calculations this has been held fixed along with the yields on other assets that compete with long-term bonds. I'm not sure that his conclusion that funding lowers the long-term bond rate by 50 basis points means that we would get a 50 basis point reduction in the cost of financing capital investment.

Now I'm sure Franco will say more about Ben's models, so I will proceed to the second part of my discussion. What Friedman is talking about here is a concrete near-term implementation of these pension funding proposals, which would raise the ratio of fixed non-residential investment to GNP from a projected 11.5 percent to — well, Ben said 12.5 percent, but I think that the magnitudes in the paper suggest it is really somewhat larger than that, say 13 percent. Roughly, that would be a rise in the share of *net* investment (of this type) to GNP from 7 to 8.5 percent. That is the macro-economic consequence of implementing a combination of the Munnell and Feldstein proposals.

What I would like to explore with you in a very rough way is what this requires of monetary policy. A careless reader or listener to Ben Friedman — I say careless because Ben would not be guilty of wishing to give the wrong impression — might think the extra 1.5 points of national saving means that you would get automatically the additional capital formation that is required to use it. If you were *very* careless, you might think the .5 point reduction in the corporate bond rate, with other rates constant, is going to do that. Well, Ben didn't mean that, and I am just reminding you that he didn't mean that and didn't say it. I am going to say something about what is involved.

I start with the long-run implications of a higher rate of national saving. Here standard practice is to assume full employment all the time, and to take the aggregate Cobb-Douglas production function that everyone falls back on in a crunch. Feldstein mentioned this in his footnotes, and so it has his stamp of approval. The function has an output elasticity of 2/3 with respect to labor and of 1/3 with respect to capital. Now assume that we have an exogenous natural rate of growth of the economy of 3.5 percent, let's say 1.5 percent or somewhat less of labor force and 2 points of productivity. Assume that we are in growth equilibrium now — you'll have to excuse all these strong assumptions — or anyway that we would be in equilibrium if we were at full employment. Then take the net investment ratio of 7 percent, divide it by the growth rate of 3.5 percent, and you have a capital-output ratio of 2. So the average product of capital is 1/2, and the marginal product is a third of that, 1/6. But that is the gross marginal product, and we've got to subtract from it the depreciation rate in order to get the net marginal product. I assume depreciation of .045. I already used that figure in going from gross to net in calculating the investment rate, so it is the appropriate one to use again. That has the nice property of getting us to the number 12 percent. Yesterday Marty told us that the pre-tax marginal product of capital is 12 percent. So I was relieved when I did these calculations that they came out right. The 12 percent might be thought to be equivalent to something like 7 percent after tax. That is the rate that savers and private investors can gain by accumulating capital, even though the marginal product for the society as a whole includes the government's share and is 12 percent under the assumptions.

Now suppose that we do increase the saving going into investment in this form by 1.5 percent of GNP. Starting now, instead of a net investment rate of 7 percent, we have 8.5 percent. We can compute what the equilibrium capital-output ratio is for that higher rate of saving. That will be, as before, the net investment rate divided by the growth rate (.085 divided by .035), and my trusty HP pocket calculator says that's 2.43. The ultimate capital-output ratio, as a result of the increased saving potential, if it were realized in investment and continued long enough, would be 2.4 instead of 2. The capital-output ratio rises by 40 percent of GNP. We can also recalculate the marginal product of capital. Once again, we take the output elasticity with respect to capital, which we have known since the

days of Paul Douglas to be 1/3, and we multiply the 1/3 by the reciprocal of 2.43. We subtract the depreciation rate just as before, and we find that the result of doing all this, if it kept on forever, would be to reduce the marginal product of capital to 9 percent. That would be the canonical number when we reconvened in the year 2050 or 2076. Marty Feldstein would tell us then that the rate of pre-tax marginal product of capital is 9 percent instead of 12 percent, but he would still say it isn't low enough and we had better do some more saving. The 9 percent is about 5.5 percent after tax, so the ultimate result is that in the long run the real interest rate (this is all real stuff) has got to be reduced by 160 basis points after tax, from about 7 to 5.4 percent.

The process I've just been describing would take a very long time — technically speaking, I guess it would take forever. But we don't have to worry about asymptotic properties. I can give you some indication by telling you what would happen to the capital-output ratio during the first year of this new austerity, in which we add to our saving 1.5 percent of GNP. Well, we start with a capital-output ratio of 2, and at the end of one year it would be 2.014. Eventually it must rise from 2 to 2.43, so in one year it has gone 14/430 of the distance. It's a long process.

All right, that is meant to show that you are not going to get a very rapid change from adopting the Feldstein-Munnell-Friedman proposals. It doesn't mean you shouldn't do it. Now, what does it take to get this new investment in the short run? I think many people would agree that to get more capital investment than accompanies the normal growth of the economy, you need the incentive of a positive difference between the rate of return on capital at its reproduction cost and the market cost of raising the funds. The cost of capital in the securities market — the bond and stock markets — to investing business firms must be below the after-tax marginal returns on their investments. That's what gives them the incentive to do the job. The difference that has to be created in the short run to induce the investment is not as large as the long-run steady-state reduction I calculated a few moments ago, but it is substantial. In the steady state we have to reduce the rate of interest by 160 basis points, according to that calculation. In the short run, in order to get the process started, we have to bring the after-tax market interest rate down by somewhat more than 100 basis points.

I didn't bring along a lot of investment equations in my briefcase, but I have one in my head which says that the short-run elasticity of investment with respect to the market valuation of capital relative to its replacement costs is around .8. A 1 percent increase in the market valuation of bonds and stocks relative to the costs of capital goods produces 8/10 of 1 percent response in investment. It takes two years to get the full response. What Ben Friedman is proposing is a 13 percent increase in gross investment. At least that's my interpretation. I'm talking about the 1.5 point increase in fixed investment relative to GNP, divided by the 11.5 base. To get that, we need a 16 percent increase in the market valuation of securities or, what amounts to the same thing, a 14 percent reduction

in the cost of capital. And if we said that the current after-tax cost of capital was something like 7 percent that means that we have to go down to 6 percent. In terms of the 10 percent rate before tax in Ben Friedman's proposal the reduction is to 8.6 percent.

This is by no means unattainable. But it is clear that the 1/2 point reduction in long-term bond rates, which would come about from holding other yields constant and just having the twist operation which Friedman's simulation tells us about, does not produce the needed interest rate stimulus. More is necessary to be sure that the additional saving, modest as it is, is successfully invested and not wasted in unemployment. There would have to be some reduction of other yields; the whole level of rates would have to go down. Friedman's twist of rate structure is not enough.

In particular, we would need a significant reduction in short-term rates. Well, I don't know what the interest-elasticity of demand for money is. But if it's 2/10 of 1 percent, then to cut short-term rates by 14 percent would take a 2.8 percent extra increase in money stock. This would be a once-and-for-all increase. It would have to be implemented over a period of time in which the apparent rates of growth of money stock as reported week-to-week would be larger than long-run sustainable rates. Actually, a bigger reduction of short rates, and a bigger monetary expansion, might well be necessary to bring long rates down as required. In order to implement this change in the composition of national output without losing the potential new saving in unemployment, you would have to have cooperation from the monetary authorities.

An alternative would be to give extra tax credit, of the same order of magnitude on investment. That brings up distributional issues. I think we already have given rather generous tax credits, so this might not be the way we want to go.

Now one other point about this calculation: when we throw extra saving into the economy, we cannot be sure it is all going to nonresidential investment. Some of it would naturally spill into houses and other types of domestic investment and into foreign investment. I guess the capital shortage that people are worried about is largely in fixed nonresidential capital. However, I personally don't see anything wrong with making the provision for the country's future retired people take the form of more houses as well as more machine tools.

My third point has to do with reasons for believing that Marty Feldstein may have overestimated the past, present and future effects of Social Security on saving and capital stock. Now I am not saying that there aren't such effects. I believe that the basic reference point of the analyses presented yesterday is the correct reference point. It is that in a pay-as-you-go system, the payment of benefits actually increases the consumption of the beneficiaries, while the contributions made in advance do not decrease the consumption of the contributors. So there is net additional consumption. But there are some significant departures from that reference point.

One is, of course, as mentioned yesterday, the inducement to retirement provided by the Social Security program itself. The second goes back to findings in the 50s by George Katona. His results contradicted the intuitive preconceptions of economists and therefore were largely dismissed. Katona found that covered workers — in those days you could distinguish in surveys between covered and uncovered workers — actually saved more outside the Social Security fund than otherwise comparable uncovered workers. Katona's explanation, which I think has some merit to it, was a rise in aspirations across an important threshold. Many people never thought, prior to Social Security coverage, that they could be on their own when they retired. They had been relying on the informal system. Once Social Security brought the goal of self-support within reach but didn't do the whole job, they were willing to do the rest of the job. Thus Social Security brought about a large change in retirement life styles. This effect, however, might be expected to weaken as time goes on, and maybe it already has.

Another point also refers mainly to the past, or at least one hopes so. Much of the history of Social Security consists of periods of underemployment when production was constrained by aggregate demand rather than by supply or by fiscal and monetary policy. In those periods the additional consumption of social insurance beneficiaries increased output and in that degree didn't displace investment. This would be so even if contributors did not change their consumption one bit as a result of the payroll taxes.

For the future, we should avoid funding Social Security at times when it would be contractionary. We don't want to be raising payroll taxes in bad economic weather. The proper procedure is for Congress to make appropriations for funding as a part of the budget. Then let Congress each year decide, following its regular budget procedure and appraising the economic situation, how much of those appropriations to pay out of taxes and how much of a deficit to run.

Another modification of Feldstein's pure theory is that beneficiaries of the Social Security program probably have to some degree increased their bequests as a result of the additional benefits. Perhaps they wouldn't do that if they completely foresaw that Social Security benefits also reduced their children's need for bequests. Nonetheless I suspect that many people were limiting bequests for lack of liquidity and therefore probably did not consume all of the additional Social Security benefits.

Another point, more relevant for the future than the past, is that the assets acquired by social insurance contributions are imperfect substitutes for other assets, in several respects. Their permanent yield is only the rate of growth of the economy in a pay-as-you-go system, and that is not as good a yield as the yield you can get by investment in physical capital. That indeed is Feldstein's main point. But as social insurance contributors also come to understand it, then they will not regard the acquisition of pension rights in a pay-as-you-go system as fully equivalent to other assets. They will do some extra saving to make up for the lower yield. The

same is true because of the illiquidities and contingencies of Social Security benefits, to which Franco called our attention earlier today.

The biggest point I would like to make is that a large fraction of the population is liquidity-constrained. These workers are not in a position to offset payroll taxes or other compulsory savings by borrowing or by dipping into previous savings. So when a payroll tax is levied on them, they are just not able to maintain consumption. To the degree that there are a large number of liquidity-constrained participants in the program, one cannot assume that they have compensated for their benefits in the future by reducing other saving or provisions for retirement. I think this could be a very substantial effect.

These are the reasons why the displacement effect is nowhere near as large as Feldstein's reference calculation, even though in the direction Marty has indicated.

To conclude, I am sympathetic with the notion that the mix of policy should try to shift the mix of national output toward capital formation of all kinds. I emphasize once again that when and if that is attempted, monetary policy must see that the additional saving actually gets into investment.

Response to Modigliani and Tobin

Benjamin M. Friedman

Since I agree with much of James Tobin's and Franco Modigliani's comments, and since many of their remarks do not bear directly on my own paper, I can be fairly brief in my response.

First, it is important to comment on a major aspect of the simulation experiments in my paper, upon which Professors Tobin and Modigliani have both touched in one way or another. Specifically, since I performed these experiments using a model of only one market (the long-term corporate bond market), they lie solidly within the sometimes troublesome realm of partial equilibrium analysis. As Professor Modigliani in particular has emphasized, for example, the simulated values of the long-term bond yield take as given the values of yields on all competing assets. To do otherwise — so as to facilitate making less qualified statements about the absolute level of the bond yield, rather than about the slope of the yield curve — I would have had to use a general equilibrium model of all asset markets. Similarly, these simulation results ignore potential feedback from induced increases in business investment, which would presumably lead not only to increased corporate borrowing (hence pressure on bond yields) but also to increased economic activity and increased demand for money (hence pressure on short-term interest rates, and through them on bond yields, in the absence of accommodating monetary policy). In addition, these simulation results have nothing at all to say about implications for the housing industry, which would probably work out more or less as Professor Modigliani has suggested. To allow for these and other feedback effects I would have had to use a general equilibrium model incorporating not only all asset markets but also the nonfinancial economy.

I certainly agree that a more general equilibrium analysis, in either of these two senses, would increase the usefulness of these experiments. Incorporating a flow-of-funds model — or even simply my own model of the bond market — within Professor Modigliani's MPS model, for example, would be a highly useful research endeavor.

Nevertheless, partial equilibrium analyses like the experiments in my paper do provide instructive insights about the first-round effects of various policy proposals. The chief message of that part of my paper is that the "preferred habitat" differences between pension funds and households

are greater than is often supposed and that, again on a first-round basis, implementation of pension funding proposals can therefore make long-term capital relatively less scarce. Since a key motivation for asking questions like these in the first instance is a concern that otherwise increasing relative scarcity of long-term capital may prevent the achievement of an adequate rate of capital formation, realizing that the first-round interest rate effects of a policy will lead to added capital formation is the point of the matter, despite the fact that feedback from the induced capital formation will in time erode the effect of policy on interest rates. The more induced capital formation (and hence the more such feedback), the better.

Next, I want to answer directly a few of the questions which Professor Tobin raised. To begin, I agree with him that, if the various proposals for civil service, military, and Social Security funding were to be implemented, these federally managed trust funds would not necessarily invest according to the portfolio preferences typically exhibited by state and local government pensions. Of course, if these trusts purchased long-term government securities then, to the extent that long-term government securities were close substitutes for the long-term corporate securities which dominate the portfolios of state and local government pensions, the effect in this context would be just the same. Nevertheless, our inability to judge in advance the portfolio behavior of these federally controlled trust funds, were they to accumulate large stocks of assets, is the precise reason why I performed each of the simulation experiments twice — once with the proposal for state and local government pensions only, and once with all four proposals together.

I also agree with Professor Tobin that, if the shift in the composition of saving toward investors preferring long-term assets is indeed to have the effect of reducing the relative scarcity of long-term capital, it is important that the Treasury not shift the mix of new U.S. government securities toward long-term issues and that the Federal Reserve not shift the mix of its securities purchases away from long-term issues. Just as preferred habitat effects present an opportunity for pension funding proposals to influence the pattern of relative scarcities within the financial markets, they also present an opportunity for debt management and open market policies to have an offsetting (or, by analogy, a reinforcing) influence.

I also agree with Professor Tobin that the relevant cost of capital for corporations is some combination of the yields on debt and equity; and I agree that, just as corporations will be trying to emphasize long-term debt in preference to short-term debt, they will be trying to issue equity whenever possible. My partial equilibrium model of the bond market cannot assess the effect of these pension funding proposals on equity yields; but, while equity purchases constitute a major share of the net asset accumulation of pension funds, they are usually a negative component in households' net asset accumulation. I would expect, therefore, that these proposals would also reduce the relative scarcity of equity capital.

I disagree with at least one premise which seems to underlie Professor Tobin's interesting arithmetic on the conditions required to shift an additional 1 percent of the gross national product into (net) capital formation. In particular, he assumes an unchanging Cobb-Douglas production function. While I do not know exactly what is the right production function today, I think instead that, whatever the production function is, after allowance for productivity trends it is shifting in the direction which requires more capital to produce the same amount of measured output. Several years ago a group of economists from New Haven — including Professor Tobin — suggested that their construct MEW ("measure of economic welfare") was superior to the conventional GNP construct in that it included environmental and several other relevant considerations. It is quite possible that, especially if MEW includes the benefits associated with energy independence, the capital-MEW ratio is not changing. The capital-GNP ratio, however, is rising as a result of large investments in expensive oil pipelines, stack scrubbers (which typically add some 20 percent to the cost of utility plants), and the like. In addition, since these pipelines require little labor maintenance once they are operational, and since stack scrubbers add only negligibly to the labor requirements of a utility plant, after allowance for productivity trends the capital-labor ratio is probably rising also.

Hence the demand for investment, to absorb additional saving induced by these pension funding proposals, will probably be present once the economy's recovery is under way. Professor Tobin is correct in pointing out that a shift in the saving schedule does not automatically lead to more investment (and I tried to say as much in my paper). Nevertheless, his arithmetic assumes no shift in the capital intensity and therefore relies on too low (and perhaps too flat) an investment function.

Finally, I can be very brief in response to Professor Modigliani's objections to two of the assumptions used in structuring the simulations in my paper. As for the incidence of Social Security taxes, I assumed full incidence on corporate profits because I wanted to use Professor Feldstein's calculations which assume that the covered wage base is invariant with respect to changes in the contribution rate. As for the dividend behavior of corporations, the assumption which I made was for convenience only (and I tried in my paper to qualify it). In principle — and here I return to the issue with which I began — both of these questions are best handled by carrying out the analysis within a full model including the nonfinancial economic system.

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