Social Security Reform in a Global Context

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The baby boom generation's entry into retirement early in the next century will place enormous pressure on public spending in the United States. The increase in the percentage of the population that is aged will inevitably drive up the burden of paying for Social Security, Medicare, Medicaid, and other government programs. Concern over the future financing of public retirement programs has stimulated growing interest in reform. Nearly all reform proposals involve scaling back the provision of public retirement benefits. Many also entail creation or expansion of private saving mechanisms to encourage or force workers to save more for their own retirement.

As the nation considers reform options, voters and policymakers should recognize that the challenge of population aging is not unique to the United States. The jump in the aged dependency rate is actually smaller and will occur later in the United States than in other rich industrialized countries. As a result, the United States will have an opportunity to learn from the experiences of Germany, Japan, and other aging societies. Even more important, many reforms that attempt to address the problems of population aging will have substantial external repercussions in an increasingly integrated global economy. Any evaluation of reform alternatives must take account of their impact on international capital markets and trade flows. Sensible planning should

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also account for the impact of other countries' reform efforts on the U.S. economy.

Countries face a choice among three broad alternatives in reforming their public retirement systems: increasing taxes to pay for a larger retired population, curtailing benefits to keep retirement programs affordable, or moving away from pay-as-you-go financing toward advance funding of future retirement obligations. The debate over the comparative merits of increasing taxes or cutting benefits is inherently divisive, because it forces generations and income classes into conflict over which group will have to make the larger sacrifice in order to maintain the solvency of the retirement system. Some of this conflict can be avoided by increasing the future national income that will finance the consumption of both workers and retirees. Advance funding is a possible way to lift future income. This alternative also holds out the promise of boosting workers' future returns. Because a portion of future benefits will be derived from investments in the capital market, returns would not be as tightly linked to real wage increases and labor force growth as they are in the present pay-as-you-go retirement system. If real capital market returns exceed the rate of growth of real earnings, many workers would be better off under a partially or fully advance-funded retirement program than they are under a pay-as-you-go system. An advance-funded retirement system could be either public or private. In a public system the additional saving would be accumulated and managed in a large government-run retirement fund. In a private system the accumulation would occur in millions of individually owned and privately managed accounts. In either case advance funding would represent a marked departure from the current system of financing, which relies mainly on current tax payments to pay for current benefits.

In what follows we focus on the option of advance funding because it raises the most significant issues for international trade and capital flows. Any move toward advance funding must increase a nation's saving rate in comparison with the rate that would occur under a pay-as-you-go system. Under standard neoclassical assumptions about growth in a closed economy, an increase in saving above the rate warranted by technical progress and the rate of growth of the working population must result in a decline in the rate of return on physical capital. As the rate of return falls, the advantage of advance funding over pay-as-you-go financing shrinks. The returns that savers can obtain on their domestically invested savings could fall to unacceptable levels. Faced with a sharp drop in the domestic rate of return, savers might look overseas for more attractive investment possibilities. Advance funding thus has important implications for international capital movements because the implied increase in national saving may be reflected in the buildup of large trade and current account surpluses. In this paper we

examine this set of issues within the context of a standard neoclassical growth model.

Our paper is divided into five main parts. The next section offers a brief overview of demographic trends and pension costs in the major industrialized countries' economies. It is followed by a detailed description of the projected costs associated with population aging in the United States. The third section examines the implications of demographic change for the balance of national saving and investment, assuming that saving is domestically invested. Although the higher future costs connected with population aging could be covered by an increase in saving, the higher saving would occur at a time of substantial slowing in labor force growth and, hence, in domestic demand for capital. As a result, the benefits of increased saving would be partially offset by a falling rate of return on capital. The final section of the paper explores the option of investing extra saving in a wider global economy as a means of moderating the decline in the return to capital.

Demography and Pension Costs in the Rich Countries

Over the next several decades the populations of the major industrial countries will grow considerably greyer. By 2030, when the American baby boom generation will be fully retired, the aged dependency rate—the ratio of people past age 64 to the number aged 15 to 64—will rise to about 30 percent in the United States, to 40 percent in France and Britain, and to nearly 50 percent in Germany and Japan (Table 1). Although all the big industrial countries share the prospect of an aging population, no two face exactly the same future. Variations in the size and timing of the demographic change, as well as important differences in public programs for the elderly, mean that population aging has different implications in each country. In this section we survey the situations of the five largest OECD countries, which together account for 77 percent of OECD output.

The dependency rate will rise most sharply in Germany and Japan, where the economic problems of population aging will be compounded by significant declines in the size of the working-age population. German and Japanese fertility rates are far below the replacement rate needed to maintain a constant population (currently about 2.1 children per woman). Official Japanese projections assume the fertility rate, currently 1.5, will gradually rise back to the replacement rate. German projections assume it will remain close to its present level, 1.4. Forecasts of the German population also assume substantial (but declining) immigration—an annual net flow of about 2.0 immigrants per 1,000 residents, compared with 5.6 per 1,000 residents earlier in this decade. Immigration is assumed to be negligible in Japan.

France and the United Kingdom face less dramatic population

Table 1
Population Structure in the G-5 Countries, 1960 to 2050

	1960	1990	2000	2010	2020	2030	2050
Aged Dependency Rate[a] (percent)							
France	18.8	20.8	23.6	24.6	32.3	39.1	43.5
Germany	15.9	21.4	24.3	30.1	35.0	47.1	51.3
Japan	8.9	17.3	25.1	34.1	43.2	43.5	50.2
United Kingdom	17.9	24.2	24.2	25.5	30.5	38.3	40.9
United States	15.2	18.7	18.7	19.1	24.8	31.9	33.5
High-Income Countries[b]	14.0	19.3	21.5	24.6	31.5	39.8	n.a.
Rest of the World	7.9	8.3	9.1	8.7	11.4	14.6	n.a.
Elderly Population, 65+ (1990 - 100)							
France	69	100	118	127	161	187	198
Germany	51	100	115	139	153	180	164
Japan	36	100	146	186	220	215	211
United Kingom	67	100	103	112	132	157	161
United States	54	100	111	124	165	213	233
High-Income OECD Countries[b]	55	100	117	138	172	206	n.a.
Rest of the World	47	100	132	164	228	324	n.a.
Working-Age Population, 15 to 64 (1990 - 100)							
France	76	100	104	107	104	99	95
Germany	68	100	101	99	94	82	68
Japan	70	100	101	95	88	86	73
United Kingdom	91	100	103	106	105	99	96
United States	66	100	110	121	125	125	130
High-Income Countries[b]	75	100	105	108	105	100	n.a.
Rest of the World	49	100	121	157	167	184	n.a.

[a]The aged dependency rate is the ratio of the number of persons over age 64 to the number of persons aged 15 to 64.

[b]"High-Income" as defined by the World Bank.

n.a. = not available.

Source: National sources. The data for France and the global aggregates are from Bos et al. (1994).

change. Fertility rates in both have fallen (to 1.8), but they have declined less than the rates in Germany or Japan. Over the next quarter century the total populations of France and Britain are predicted to grow while the working-age populations will remain roughly unchanged. Dependency rates will rise because of the increasing number of elderly. Although the elderly population is projected to grow fastest in the United States, the U.S. aged dependency rate will grow the least. The American fertility rate is now above 2.0, and immigration remains strong (4.4 net immigrants per 1,000 residents), so the working-age population will continue to expand, albeit much more slowly than it has in the past.

Official forecasts in all five countries suggest only modest gains in future life expectancy. In Japan, for example, life expectancy is predicted to improve over the next 30 years at one-sixth the rate of the past 30 years. In the United States, life expectancy is predicted to rise at just one-half the rate of the recent past. These projections may understate likely improvements in longevity, implying that the future rise in the aged dependency rate could be even greater than suggested in the official forecasts. From an economic growth perspective, the most striking feature of Table 1 is the pervasive deceleration of labor force growth in the major OECD countries. In Germany and Japan the future working-age populations are actually predicted to shrink. Combined with a continuation of the post-1973 slowdown in total factor productivity gains, one implication of the trend toward slower labor force growth is a much slower rate of aggregate income growth—and, thus, lower requirements for future investment.

The differences among the countries in projected pension costs are even greater than implied by the disparities in underlying demographic trends because of important differences in the generosity of the countries' public pension schemes. Germany and France have the highest public pension costs as a percentage of GDP (Table 2). Both countries offer a very generous public pension. Both also allow workers to claim pensions at a comparatively early age. And both have used their pension systems to finance early retirement for the long-term unemployed. The United States and the United Kingdom have the smallest current pension burden, and their costs will rise least in the future. In fact, British pension costs will decline as a share of GDP. Britain is in the process of scaling back its basic public pension, and it has moved toward allowing individuals to opt out of the earnings-related public system into qualified private pension schemes. In essence, the United Kingdom has already curtailed public programs for the elderly. Assuming these cutbacks are politically sustainable, the country is unlikely to face a fiscal crisis connected to population aging.

The International Monetary Fund has evaluated the public fiscal pressures arising from population aging in the rich countries. A recent IMF study examined the future costs of each country's public pension system through 2050 and estimated the present discounted value of the net liabilities (that is, gross future obligations in excess of present reserves plus predicted future revenues). The net liabilities are shown in line 4 of Table 2, measured as a percent of current GDP. France, Germany, and Japan clearly face the most severe financing problems—net liabilities of their public pension systems exceed their current GDP. The net liabilities of public pensions are much smaller in the other two countries—just 5 percent of GDP in the United Kingdom and 25 percent of GDP in the United States.

While population aging is pervasive across the rich industrialized

Table 2
Public Sector Financing of Programs for the Aged in the G-5 Countries, 1995 to 2040

	France	Germany	Japan	United Kingdom	United States
1. Public Pension Costs—1995 (Percent of GDP)	10.6	11.1	8.6	6.5	5.1
2. Net Replacement Rate[a] (Percent)	78.0	63.0	55.0	50.0	50.0
3. Pension Cost Projections (Percent of GDP)					
1995	10.6	11.1	8.6	6.5	5.1
2000	11.5	11.4	10.5	6.3	5.1
2010	12.6	12.0	14.0	6.2	5.3
2020	14.8	13.3	14.8	6.0	6.1
2030	17.2	14.1	15.5	6.2	6.8
2040	20.4	14.2	n.a.	5.7	6.8
4. Present Value of Net Pension Liabilities (Percent of GDP)	113.6	110.7	106.8	4.6	25.7
5. Health Care Spending (percent of GDP)					
Total (public plus private)	9.1	8.5	6.6	6.6	13.7
Public spending	6.1	6.1	4.8	5.5	6.1

[a]After-tax value of public pension as a percent of after-tax wage while at work, for average-wage worker.

n.a. = not available.

Source:

1. Roseveare and others (1996) for France and Germany; Takayama (1996) for Japan (data for 1993); Franco and Mundzi (1996) for the United Kingdom; and the OASDI Trustees Report (1996) for the United States. Includes public employees.
2. Rates for Europe are averages of data shown in column 3, table 3.1 of Davis (1996). The net rate is the after-tax benefit as a percent of the after-tax average wage. Comparable rates for the United States were computed using an average gross replacement rate of 42 percent, and an employee tax rate of 15 percent. The 42 percent is the average retiree benefit in 1994. The estimate for Japan is based on a gross replacement rate of 45 percent and a 16 percent average tax.
3. Compiled by authors on the basis of national estimates in Bosworth and Burtless (1997).
4. Chanel and Jaeger (1996), p. 17. Net liabilities are projected benefits less contributions out to 2050.
5. OECD Health Data File. All the data are for 1991 except data for the United States, which are for 1994.

world, readers should bear in mind that most of the world's population lives outside the rich countries. High-income OECD economies account for three-quarters of the world's output, but they contain just 15 percent of the world's population. The developing world faces a very different demographic future from that in the industrialized world. As shown in Table 1, the working-age population will continue to grow rapidly in the rest of the world. In view of the very low levels of capital per worker in the developing world, the potential demand for capital in that region is large. The developing countries will eventually face a rising aged-dependency rate, of course, but the trend in population aging lags that in the high-income countries by more than half a century.

Aging in the United States

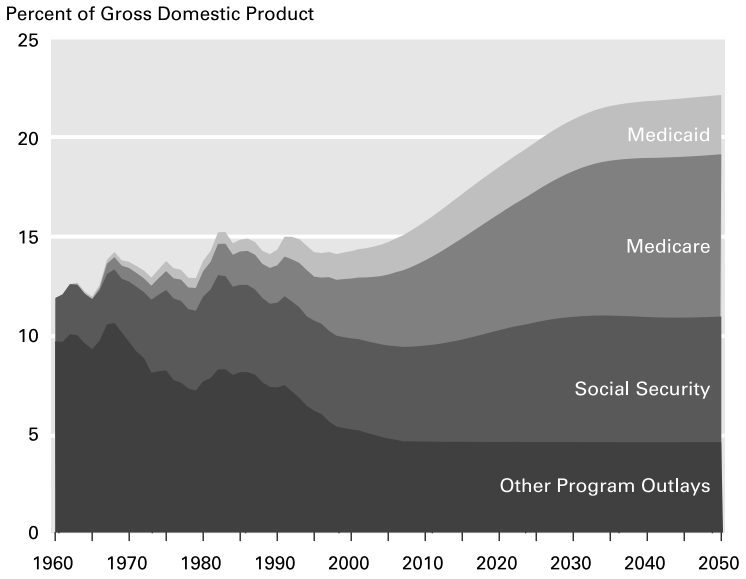
The change in the age structure of the U.S. population is considerably smaller than it is in other rich countries. The United States also operates a smaller public retirement system and relies to a greater extent on private pensions to finance retiree consumption. The upshot, as shown in Table 2, is that the long-term financing problem in the U.S. public pension system is modest in comparison with the problem in most other industrialized countries. Projections that focus solely on the cost of the public pension system understate the fiscal burden associated with population aging, however. Under current official forecasts, the cost of providing public health insurance to the elderly will exceed the predicted cost of public pensions by 2020. As a result, combined public spending on pensions and health care for the elderly will increase dramatically when measured as a percentage of GDP. Unless benefits under the pension and health insurance systems are curtailed, future federal taxes as a share of GDP must increase substantially.

We can be more precise about the exact size of the increased burden. The Social Security Trustees prepare annual projections of the cost and revenues of Social Security and Medicare extending out over a 75-year horizon. The Congressional Budget Office recently incorporated those estimates into its own budgetary projections to compile forecasts of the long-term cost of maintaining the existing structure of federal programs.[1] CBO's projections are summarized in Table 3 and Figure 1.

The CBO forecast has sobering implications for future government finances. If Social Security, Medicare, and Medicaid are left unchanged, federal spending on existing programs will climb much faster than aggregate income, causing total federal outlays to rise from 19.5 percent of GDP in 1995 to 24 percent of GDP by 2025 and to 26 percent of GDP by 2050. Under existing tax law, federal revenues rise roughly in proportion to GDP. The budget deficit, fueled by growth in spending on the elderly and steep increases in debt service costs, will therefore reach 9 percent of GDP by 2025, a level that would probably exceed net private saving in that year. This combination of policies is not sustainable in the long run, because with no net investment the economy would eventually begin to shrink and standards of living decline. Federal outlays on programs that are specifically targeted on the elderly are predicted to rise from 8 percent of GDP in 1995 to 15 percent of GDP in 2025 and 17 percent of GDP in 2050. In part, these higher costs can be offset by reduced spending in other areas, but the net increase in program outlays will be 5 percent of GDP by 2025, according to the CBO forecast. Thus, an

[1] The latest analysis is provided in Congressional Budget Office (1997b).

Figure 1
Projected Federal Budget Outlays for Transfers, Grants, and Subsidies



Source: *Survey of Current Business,* various issues and CBO (1997b).

Table 3.
Projected Federal Budget Outlays and Revenues, 1960 to 2050
Percent of GDP

	1960	1980	1995	2010	2025	2050
Social Security (OASDI)	2.2	4.3	4.5	5.0	6.0	6.0
Medicare	.0	1.3	2.5	4.0	7.0	8.0
Medicaid	.0	.5	1.3	2.0	2.0	3.0
Consumption Programs	9.7	7.7	6.3	5.0	5.0	5.0
Other Programs	3.8	6.6	4.9	4.0	4.0	4.0
Program Outlays	15.7	20.5	19.5	20.0	24.0	26.0
Interest	1.3	1.9	3.2	3.0	5.0	12.0
Total Outlays	17.0	22.4	22.6	23.0	29.0	38.0
Receipts	18.4	20.2	20.4	20.0	20.0	20.0
Budget Balance	1.4	−2.2	−2.2	−3.0	−9.0	−18.0

Source: *Survey of Current Business*, various issues and CBO (1997b).

effective federal tax increase amounting to roughly 25 percent of current rates is needed to keep federal debt in check.

As already noted, Social Security represents only a small part of the problem. Under the assumptions in the Social Security Trustees' intermediate forecast, benefit payments will rise by about 1 percent of GDP over the next quarter century and by 2 percentage points over the next 75 years. The annual deficit in the Social Security trust fund (excluding interest) rises even faster than this because of continued erosion in the Social Security tax base relative to GDP.[2] Medicare outlays will surpass those of Social Security by 2020, and the predicted Medicare deficit is three times that of Social Security in both 2025 and 2050.[3] Social Security and Medicare have very similar beneficiary populations. But whereas the annual Social Security pension will be cut back relative to the average wage by about 10 percent by 2025, Medicare costs per beneficiary are projected to exceed the rate of wage growth through 2020 and to parallel the growth of wages thereafter.[4]

Population aging has an especially pronounced effect on public medical insurance costs. Unlike most other rich countries, the United States offers comparatively little public health insurance to the nondisabled working-age population. However, it provides very costly public health insurance to the aged. The publicly financed health insurance costs of Americans past age 64 are about 12 times those of individuals who are age 15 to 64.[5] Consequently, population aging will cause steep increases in public budgets for health insurance. One of the peculiarities of the U.S. policy debate is that most of the discussion of reform focuses on the public pension programs whereas most of the growth in fiscal burden is associated with providing medical care for the aged.

The attainment of retirement age by the huge baby boom generation is certainly a major factor behind the projected deterioration in public sector finances. The sharp slowing of growth in the working-age population is at least as important, however. The number of Americans past age 64 is projected to grow by 1 percent a year between 1995 and 2010. The number will then rise 3 percent a year over the following 15 years.

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[2] The share of taxable wages in GDP declines by 2.5 percentage points by 2025 because of assumed continued growth in the untaxed portion of labor compensation. Employer contributions to private pension and health insurance plans, which are not subject to Social Security or Medicare payroll taxes, are assumed to grow faster than overall labor compensation. Consequently, Social Security revenues will increase more slowly than GDP, widening the annual deficit.

[3] OASDI Trustees, *1996 Annual Report* (Social Security Administration 1997).

[4] The decline in the OASDI benefit rate is largely due to the scheduled increase in the normal retirement age from 65 to 67. In contrast, the projected slowing of medical care costs is only an assumption.

[5] Aaron and Bosworth (1997, pp. 268–70). The dichotomy between public financing of health care for the elderly and private financing for the nonelderly implies that focusing on public sector costs overstates the medical cost burden of aging for the nation as a whole.

Note that this is the same rate of increase in the number of elderly that occurred between 1940 and 1965. What distinguishes the period after 2010 is the sharp slowdown in the rate of labor force growth. Over the past three decades, the work force has increased at an annual rate of 2 percent. But low fertility will reduce the rate of labor force growth to just 0.2 percent a year after 2010.

Aging, Technical Progress, and Saving

The question of how societies ought to adjust their saving in response to population aging is a surprisingly contentious one. Demographic change can in theory affect saving through several channels. Unfortunately, there is no consensus on their relative empirical importance. This leaves considerable uncertainty about the future trend of private saving, even in the absence of policy change.

The life-cycle consumption model offers the most popular framework for analyzing the effect of population age structure on aggregate saving. According to this model, farsighted workers rationally plan their consumption over a full lifetime. In devising their lifetime consumption plans, they take account of the likely path of their labor earnings as they age and prudently accumulate savings in anticipation of their retirement. They dissave in retirement. The goal of a good consumption plan is to maximize the worker's lifetime well-being, subject to the constraint that lifetime consumption cannot exceed the worker's lifetime wealth. Lifetime wealth consists of the worker's initial assets and the present discounted value of anticipated labor earnings and other kinds of income that are not derived from initial assets or labor earnings. The basic model predicts a hump-shaped profile of saving over the life span. Several studies have used this framework to analyze the likely effects of population aging. Most conclude that an increase in the proportion of aged dissavers in the population will reduce the aggregate saving rate.[6]

Some economists are skeptical of the life-cycle framework, however, because simple versions of it are not very successful in accounting for important aspects of personal saving. For example, many American workers enter retirement without any assets. A large percentage of workers who do accumulate assets apparently continue to add to them after they retire. Neither fact is easy to reconcile with simple versions of the life-cycle model. Theorists are thus forced to adopt modifications in the basic theory to account for obvious empirical contradictions. There is also a substantial body of evidence suggesting that the life-cycle model offers an inadequate explanation of the influence of demographics on

[6] Examples are Auerbach et al. (1989), Auerbach, Cai, and Kotlikoff (1990), and Heller (1989).

saving. First, the model does not accord well with past trends in aggregate saving. Survey data suggest that most of the change in saving over time has been the result of changes in saving within age groups rather than changes in the proportions of workers and retirees in the population.[7] In the United States, the movement of the baby boom generation into age brackets with peak life-cycle saving should have caused a noticeable increase in private saving after the early 1980s. Instead, the private saving rate plunged.

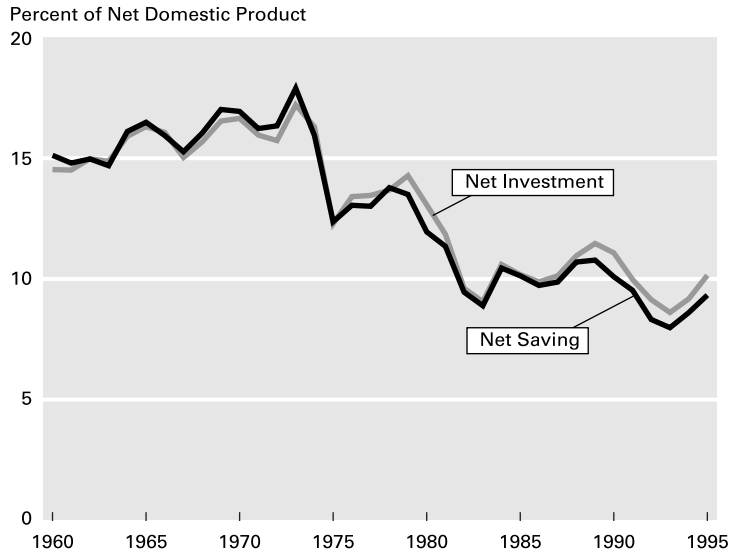
Nor has private saving increased in step with the sustained rise in the length of planned retirements. If we define the average male retirement age as the youngest age at which fewer than half of men in an age group remain in the labor force, the average male retirement age fell from 74 to 62 between 1910 and 1996, a drop of about 1.4 years per decade. The decline in the average retirement age occurred in an environment of rising life expectancy among older Americans, especially in the period after 1940. Falling mortality rates among the elderly added 3 years to the expected life span of a 65-year-old man and 5.5 years to the life expectancy of a 65-year-old woman after 1940. Since expected male life spans increased about 0.6 years per decade during a period in which the retirement age dropped 1.4 years per decade, the amount of the male life span devoted to retirement has climbed about 2 years per decade in the United States. Under most versions of the life-cycle model, the increase in the length of planned retirement should have boosted pre-retirement saving. That has not occurred.

Moreover, as emphasized by Tobin (1967), the life-cycle model with forward-looking expectations should lead to an inverse correlation between the rates of per capita income growth and saving. Tobin noted that as the anticipated rate of real earnings growth rises, rational consumers will postpone the sacrifice of reducing their consumption to future periods in which they expect to have higher incomes. Contrary to this prediction, however, we observe a persistent positive association between saving rates and long-term rates of income growth, both across countries and over time. Slowing aggregate income growth in the OECD economies over the past quarter century has been associated with a significant decline in the rate of saving in the great majority of countries.

It is important to view the effects of population aging within a general equilibrium context that takes account of the demand for saving as well as its supply. All of the major industrial economies are predicted to experience large and persistent declines in their rates of labor force

[7] Bosworth, Burtless, and Sabelhaus (1991), Bosworth (1993), and Attanasio (1994). Horioka (1992) does find a strong time series correlation between the decline in the Japanese saving rate and population aging, but the microeconomic survey data suggest it is not due to a shift in the proportion of workers versus retirees.

Figure 2
Saving and Investment in the OECD



Source: OECD, *National Accounts.*

growth. This slowdown, unless it is offset by an increase in the rate of labor-augmenting technical change, will translate into a sharply lower rate of output growth and demand for new capital. For example, in the CBO's long-term budget projections, discussed above, the annual growth of the U.S. labor force slows by a full percentage point by 2025. Under conditions of balanced growth, the warranted investment rate would drop by an amount equal to the slowing of output growth times the capital–output ratio. The ratio of reproducible business capital to GDP is approximately unity in the United States. If we include the residential capital stock, the capital–output ratio is about two. Thus, we might anticipate that the drop in the warranted investment rate may amount to as much as 2 percent of GDP, or almost 40 percent of the increased net budget costs associated with future population aging.

To a large extent, this decline in the "warranted" investment rate is already reflected in the actual saving–investment balance of OECD countries. As shown in Figure 2, saving and investment averaged a relatively steady 15 percent of OECD output during the 1960s. There may even have been an upward trend until 1973, the year of the first oil crisis and the starting point for a protracted period of sharply slower output growth. Both saving and investment fell precipitously in the 1974–75

Table 4
Saving, Investment, and Output Growth
Percent of Net National Product

	Average		Change	
Category	1965-73	1985-92	Actual	Expected
Private Investment				
United States	9.1	5.4	−3.7	−3.9
Europe	12.6	7.1	−5.6	−7.0
Japan	20.7	11.0	−9.7	−13.0
Private Saving				
United States	10.6	7.9	−2.7	−4.6
Europe	13.7	10.6	−3.1	−7.6
Japan	20.0	11.9	−8.1	−12.5
Output Growth				
United States	3.9	2.2	−1.7	n.a.
Europe	4.5	2.0	−2.5	n.a.
Japan	9.6	3.6	−6.0	n.a.
Implied Capital-Output Ratio				
United States	2.3	2.4	.1	n.a.
Europe	2.8	3.6	.7	n.a.
Japan	2.2	3.1	.9	n.a.
Implied Wealth-Income Ratio				
United States	2.7	3.6	.8	n.a.
Europe	3.1	5.4	2.3	n.a.
Japan	2.1	3.3	1.2	n.a.

n.a. = not applicable.
Source: OECD National Accounts, and authors' calculations as described in the text.

recession. Even more notable is the lack of a full recovery of investment or saving in the expansion that followed. Rates of saving and investment declined again in the 1980s, and both have remained below 10 percent of output in recent years. The declines in saving and investment are widespread across all of the OECD countries. The drop in saving is evident in household saving, in private (household plus business) saving, and in aggregate national saving.

In light of mainstream economic theory, the falloff in saving, not investment, is the bigger surprise. This is illustrated in Table 4, where we calculate the change in the investment rate needed to maintain an unchanged capital-output ratio and the change in saving rate required to hold the wealth–income ratio constant. U.S., Japanese, and European rates of output growth in the periods 1965–73 and 1985–92 are shown in the middle of the table. The drop in the growth rate is smallest in the United States and largest in Japan. Similarly, the fall in private saving and investment rates is smallest in the United States and largest in Japan. We can obtain a rough estimate of the incremental capital–output ratio in

each subperiod by dividing the investment rate by the rate of output growth. That value is shown in the lower portion of the table. Multiplying the capital–output ratio times the change in the output growth rate provides a simple approximation of the anticipated drop in the investment rate. The actual and anticipated changes are very similar (see columns 3 and 4 in the table). If anything, the investment rate did not fall as much as anticipated. This is reflected in the lower portion of the table by the rise in the capital–output ratio after 1973.

Many economists will object that our reasoning has causation backwards: The decline in investment caused the decline in output growth, rather than the other way around. To some extent that is true. But most of the decline in output growth can be traced to slower growth in total factor productivity, not to the fall in the rate of capital investment. A variety of growth accounting studies have decomposed the change in output into its three principal components—the change in employment growth, the change in total factor productivity (technology), and capital–labor substitution (capital deepening). It is plain in those studies that the largest part of the decline in output growth is due to a negative technology shock that dramatically slowed improvement in total factor productivity.[8] Our claim that the fall in the investment rate has been somewhat smaller than would be anticipated under conditions of balanced growth is reinforced by the observation that the capital–output ratio has risen since 1973.

The drop in private saving rates throughout the OECD is harder to explain using modern versions of the life-cycle theory. Forward-looking variants of the life-cycle model suggest the saving rate should rise in response to a decline in the anticipated rate of long-term income growth. That is, a negative productivity shock should lower the investment rate, but boost the saving rate. Though this combination may be impossible to achieve in a closed economy, it is feasible in an open economy where excess saving can be invested abroad. International capital mobility may be limited, of course. In that case saving may be forced down by the need to maintain balance with domestic investment requirements.

Saving rates in the United States and the OECD have declined over the past quarter century, but it is reasonable to ask whether future saving ought to rise or fall in anticipation of a much older population age structure. From one perspective, it can be argued that a cohort expecting to live longer in retirement should increase its preretirement saving in anticipation of its greater retirement consumption needs. If it did so, and if its added saving increased the future flow of national income, the burden on future workers of supporting a larger retired population would be reduced. This is the view we adopted in an earlier study that

[8] See, for example, OECD (1997).

examined the consequences of accumulating a larger reserve in Social Security system (Aaron, Bosworth, and Burtless 1989).

Under another view, the sharp slowing of future work force growth implies a reduced demand for future capital and a decline in the rate of investment required to achieve any given capital–output ratio. As long as saving and domestic investment are tightly linked, the projected aging of the population offers society a near-term consumption dividend. The saving rate can fall—and consumption increase—while maintaining the capital–output ratio. This perspective was adopted by Cutler et al. (1990) in their analysis of the relationship between increased dependency and the optimal rate of saving. They argued that efforts to accumulate capital at a faster rate than that warranted by growth in the labor force and labor-augmenting technical change must translate into a continually falling rate of return to capital. Even with a reduced investment rate but positive growth in total factor productivity, future workers would enjoy rising real incomes. In models in which the utilities of different generations are linked and the consumption needs of future generations are discounted, it is rational to tax the higher-income future generations more than the current generation. Cutler et al. conclude that the optimal rate of saving should decline in response to population aging.

They also argue that the effects of slowing labor force growth may be counterbalanced by some offsetting improvements in total factor productivity. A work force with fewer new entrants is a more experienced work force and hence a more productive one. The authors offer some evidence in support of their hypothesis, and their theory is incorporated in the CBO projections discussed earlier (Cutler et al. 1990, pp. 39–45). At the same time, technological innovations have led to continued declines in the relative price of capital goods. Over the past decade, the price of capital goods has fallen at an annual rate of 1.5 percent relative to that of consumption goods and services. Should the decline in the relative price of capital continue, investment needs (measured in terms of consumption sacrifice) would drop even more sharply in the future.

The general equilibrium perspective adopted by Cutler et al. is useful in showing that the policy of increased saving can be a suboptimal response to population aging, because aging is itself linked to a decline in investment opportunities. But the authors restrict their analysis to an economy in which only one important feature of the environment has changed—the fertility rate. In the United States and other industrialized economies, several important changes occurred over the past half century. Life spans lengthened, fertility declined, productivity growth fell, and public and private saving rates plummeted. Two of these trends—longer life spans and lower fertility—are the source of population aging. The fertility decline by itself does not provide a solid justification for increased saving. But rising longevity and earlier retirement do provide good reasons for workers to boost their saving. In an environment of

slower labor force growth and sluggish technical advance, the returns from saving may be lower than they were in the earlier postwar period, especially if additional saving can only be invested domestically. If savers are offered good returns on overseas investments, the advantages of a high-saving strategy may be more attractive.

A Neoclassical Growth Model

We can weigh the advantages of a high-saving strategy by examining potential future income gains if additional saving were invested domestically or overseas. This evaluation can be performed within a small simulation growth model that is calibrated to match the 75-year economic and demographic forecasts of the Social Security Trustees.[9]

In a standard growth model, national output is produced by combining the factors of production. In the Cobb-Douglas production function, capital (K) and labor (L) are combined in period t to produce total output (Y).

$$Y_t = A(t)K_t^{\alpha}L_t^{1-\alpha}, \tag{1}$$

where $A(t)$ is an efficiency parameter that rises from year to year as a result of technical progress. Historical data on capital's share are taken from the national accounts and the share is set at 0.28 in our projections. Labor supply in period t is assumed fixed and is taken from historical statistics and the Social Security Actuary's forecast.[10] The capital stock is not mentioned in the Social Security forecast. It must be calculated in a base year using information published by the U.S. Department of Commerce and then projected in future years as the capital stock in the base period plus the cumulative sum of domestic investment, I, over the projection period, with a constant geometric rate of depreciation, δ:

$$K_t = (1 - \delta)K_{t-1} + I_t. \tag{2}$$

The compensation rate for labor, w, and the gross rate of return on capital, r, are determined by the marginal conditions

$$w = \partial Y/\partial L = (1 - \alpha)(Y/L), \tag{3}$$

and

$$r = \partial Y/\partial K = \alpha(Y/K). \tag{4}$$

[9] The structure of the model is very similar to the one developed in Aaron, Bosworth, and Burtless (1989).

[10] The labor supply could easily be made endogenous, but we do not know whether deviations in real wages from their baseline path would have large or even predictable net effects on labor supply.

The rate of interest on financial assets, as well as the gross profitability of businesses, is tied to movements in r.

Gross saving is the sum of net saving (S) and capital consumption allowances (CCA). It is divided between domestic investment, I, and net foreign investment, I_F:

$$I + I_F = S + CCA. \tag{5}$$

If the United States were a closed economy, I_F would be zero by definition. Annual additions to the capital stock could be calculated simply from knowing S. Since the United States is an open economy, I_F can be positive or negative depending on whether the nation runs a surplus or deficit in its trade account.

Net national saving consists of government and private saving—

$$S = S_G + S_P, \tag{6}$$

where

$$S_P = S_{Pen} + S_{HH} + S_O. \tag{7}$$

Government saving (S_G) is the difference between taxes (T) and spending on current government consumption (G).[11] In the model we distinguish between the Social Security operating surplus—Social Security taxes less benefit payments—and saving in the remainder of government operations.[12] Private saving consists of pension saving (S_{Pen}), non-pension household saving (S_{HH}), and other corporate retained earnings (S_O).

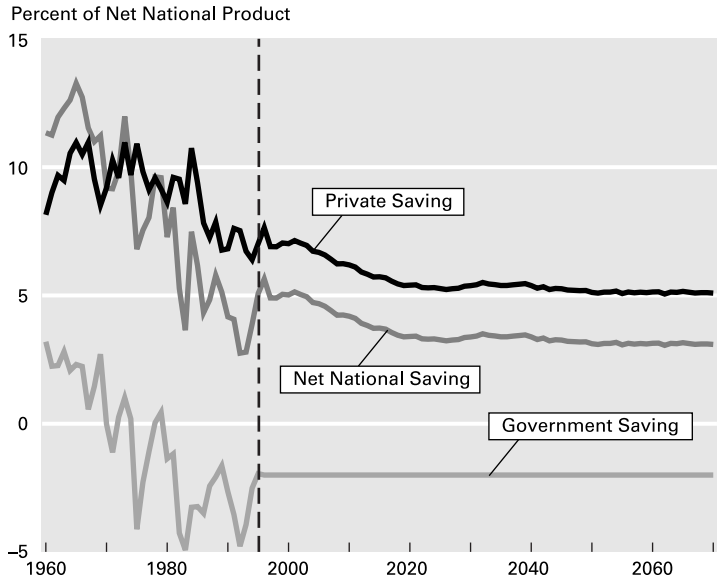
The model described in equations (1) through (7) can be solved after specifying the relationships that determine public and private saving and the division of national saving between domestic and foreign investment.[13] Rates of net saving can be controlled exogenously, and investment is disaggregated between housing, government capital, inventories, short-lived computer equipment, and other fixed business capital. We have assumed a baseline case in which the growth of the business capital stock parallels that of output, maintaining a constant rate of return to

[11] The U.S. national accounts now include a capital account for the government sector.

[12] Interest on the Social Security trust fund is ignored in this formulation. Interest payments earned by the fund are an expense for the remainder of the government, so the interest payments have no net effect on government saving. Net saving in government employee pension plans is treated as part of household saving rather than government saving. Contributions and withdrawals from these plans are treated in exactly the same way as contributions and withdrawals from private pension funds.

[13] Our model divides the national economy into several sectors, including nonfarm business, housing services, and nonprofit and government entities. Each sector uses inputs and produces a flow of goods and services under a unique production function. We use historical relationships to allocate investment and workers across these sectors.

Figure 3
Baseline Net Saving Rates in the United States



Source: U.S. Bureau of Economic Analysis and authors' calculations.

capital. That results in a domestic rate of net investment that declines slightly in real terms.[14] As shown in Figure 3, the net national saving rate is 5 percent of net national product (NNP) in 1995 and it drifts down in the baseline to about 3 percent in 2020 and thereafter. We have arbitrarily assumed that all of the decline is in the private sector, and we hold the government saving rate constant at the 1995 value of −2.0 percent. As a starting hypothesis, we assume that net foreign investment is a constant but modest fraction of national output. Under this assumption domestic investment will then vary directly with movements in national saving.

Domestic investment is aggregated into a measure of the aggregate capital stock and the flow of capital services. This allows us to solve for the rate of technical efficiency change in (1) that exactly reproduces the Social Security Trustees' 75-year forecast of future GDP and average worker compensation. Deviations from this baseline assumption about

[14] The gross investment rate is affected by two other factors. The rate must rise in real terms as the mix of investment shifts increasingly toward shorter-lived assets. However, it will fall as the relative price of investment goods continues to decline.

Table 5
Economic Effects of a Permanent Rise in the Saving Rate, Invested Domestically
Percent Change from Baseline

Year	Wealth	Capital Services	GDP	NNP	Consumption	Rate of Return	Wage Rate
2000	1.0	.9	−.1	−.1	−1.3	−.4	.0
2010	9.8	10.9	1.9	1.1	−.2	−8.5	2.7
2020	18.2	20.6	3.8	2.4	1.0	−15.7	5.1
2025	22.5	25.5	4.8	2.9	1.5	−19.1	6.3
2030	26.8	30.2	5.7	3.5	2.0	−22.3	7.4
2040	34.9	39.2	7.4	4.4	2.8	−28.3	9.4
2050	43.1	48.1	9.0	5.2	3.5	−34.0	11.3

Note: Net saving rate raised by 1 percent of NNP beginning in 2000. All values are measured in constant prices.

the determinants of national saving will produce deviations in the future path of investment, national output, wages, private saving, and Social Security surpluses and deficits.[15]

Increased Saving, Invested Domestically

In our first simulation, summarized in Table 5, net national saving is increased by 1 percent of NNP in the year 2000 and held at the higher rate for 50 years.[16] For the present purposes, it makes no difference whether the increase in saving is assumed to occur in the public sector (through larger Social Security surpluses) or in the private sector (through larger private pension accumulations). We assume that net foreign investment is a small, negative, and constant share of NNP throughout the projection period. We further assume that the relative price of capital goods will continue to decline in the future but at a diminishing rate.[17] As a result, saving, measured in forgone consumption, yields a bonus in increased real capital. On the margin, most of the added saving flows into the business sector, where the added investment increases the level of the capital stock. The supply of capital services expands by nearly 1 percent a year compared with its level in the low-saving baseline. By 2025, capital services are 25 percent higher than in the baseline (column 2).

[15] See Aaron, Bosworth, and Burtless (1989), pp. 55–82 and 131–33.

[16] The effects of an increase in the net saving rate need to be sharply distinguished from those associated with an increase in the gross saving rate. In the latter case, the increment to the capital stock is gradually offset by an increase in depreciation allowances, and the impact on the capital stock and output recedes toward zero.

[17] The relative prices of individual components are constant after 2020, but the overall price of capital continues to fall at about 0.1 percent per year after 2020 because of a shift toward lower-cost capital (mainly computers). See note 14.

As a result of the larger capital stock, national output, labor productivity, and real wages all rise. The enlarged flow of capital services contributes to a 2.9 percent gain in NNP after 25 years and a 5.2 percent increase in NNP after 50 years (column 4). Not surprisingly, the policy of increased saving means that consumption must fall over the first 10 years, but the additional investment and larger capital stock eventually boost consumption, which rises 1.5 percent by 2025 (column 5). In comparison, the CBO estimates that population aging and rising transfer costs will push up federal program outlays by 4.5 percent of national output between now and 2025 (see Table 3). By implication a permanent increase in the national saving rate amounting to 2 to 3 percent of NNP would be needed to boost consumption in 2025 by enough to offset the extra burden of higher federal spending. A high-saving policy offers large benefits to future wage earners. Real wages are predicted to rise 6 percent above their baseline level by 2025 (column 7). Since the production function relates gross output in the business sector to the inputs of capital and labor, the average real wage rises in line with gross output in that sector. The percentage gain in net national income is considerably smaller, however, because a larger capital stock generates higher annual depreciation, which is subtracted from gross output in the determination of net output.[18]

A striking feature of the simulation results is the steep fall in the rate of return to physical capital (column 6). In comparison with the rate of return in the baseline, the real return falls one-fifth after 25 years and one-third after 50 years. (In the baseline case the real return remains constant over the entire 75-year projection period.) The decline in the rate of return follows directly from the large rise in the capital–output ratio, since the return to capital is equal to capital's share in income times the capital–output ratio. The decline also implies a very large redistribution of income from owners of old capital to labor. Future workers enjoy sizable and growing income gains while capital owners suffer large losses relative to the baseline path. Thus, in addition to gains in aggregate output, a policy of boosting national saving and investing exclusively in the United States would be good for future workers. The gains to workers are less clear if the increase in saving has been achieved through a forced saving plan in which workers are forced to accumulate larger private pensions. In that case, the decline in the rate of return on capital will also be reflected in a lower rate of return on their pension fund investments.

We do not know how the decline in the capital return would be distributed among the different types of financial assets, that is, between

[18] Economywide wage rates are ultimately determined by labor productivity in the business sector where the percentage increase in output is slightly larger than it is for the economy as a whole.

bonds and equities. It is surprisingly difficult to find a strong correlation between the returns on real and financial assets.[19] Over periods as long as a decade, the yields on most financial assets are dominated by fluctuations in their market values. In fact the return on each asset is adjusting to the returns on others, with causality running in both directions, and all returns are influenced by a host of other separate factors. Because we are considering returns over a 75-year horizon, we assume that the return on real assets is reflected in proportionate declines in the returns on bonds and equities with a lag that stretches over a decade.

Is it realistic to expect that a 1 percent rise in net national saving would produce the sharp decline in rate of return shown in Table 5? The decline may seem excessive when viewed in light of the new endogenous growth literature. Economists contributing to this literature argue that a positive correlation exists between the rate of capital accumulation and total factor productivity (TFP) growth. If a higher investment rate induced a more rapid rate of technological innovation, the decline in the rate of return to capital would be considerably smaller than predicted by standard neoclassical growth models. The empirical evidence in support of endogenous growth models is limited, however. In fact, in a recent growth accounting study for 88 developed and developing countries over the period from 1960 to 1994, changes in TFP and capital accumulation were found to be essentially orthogonal (Collins and Bosworth 1996). Some correlation exists in the industrial economies before 1973, but the correlation has vanished in the more recent period. There is little evidence of a correlation between capital accumulation and TFP in the developing world. It seems reasonable to believe that those projects with large advances in technology have very high returns and are among the first to be undertaken. Thus, TFP growth would not be associated with variations in investment at the margin.

Investing Overseas

If additions to saving are invested domestically, increases in net national saving yield a sizable drop in the return on capital under the assumptions we have used so far. It seems implausible that savers would accept this decline if more favorable investment alternatives existed elsewhere. One possibility is that savers would divide their extra saving between domestic and overseas investments in order to maintain the highest possible rate of return consistent with their attitude toward risk. Cutler et al. (1990) explored some of these issues by incorporating the rest of the OECD into a two-country model. Since the declines in future labor

[19] One attempt to estimate the relationship can be found in Howe and Pigott (1992).

force growth and capital needs are even more pronounced in other OECD countries, the extension reinforced their arguments in favor of reduced U.S. saving. In the near term, consumption can rise in the United States as the rest of the OECD takes advantage of better investment opportunities in this country. Because investment opportunities are declining even faster in the rest of the OECD than they are in the United States, foreign savers are increasingly willing to invest here even though the rate of U.S. labor force growth is slowing.

The analysis by Cutler et al. ignored a major part of the world economy, however. The labor force outside the OECD accounts for 80 percent of the world's total, and it will continue to grow rapidly for at least several more decades (Table 1). Using purchasing power parity exchange rates, the non-OECD economies account for 40 percent of global output. Because the non-OECD countries have low capital–labor ratios, they also have a latent capacity to absorb large volumes of added investment. Furthermore, their economies have been growing at an average rate twice that of the industrial countries. Thus, the considerations that limit the attractiveness of large net capital flows from the United States to the rest of the OECD do not apply.[20] On the other hand, most of the non-OECD economies have undeveloped capital markets that might not be able to absorb significant capital inflows. They also have a history of large risks for foreign investors.

Through the 1980s the improvement and integration of international financial markets appeared to be a phenomenon limited to the industrial economies. Memories of the debt crisis in the early years of the decade excluded most developing economies from participating in this development. The situation has changed rapidly over the 1990s. Aggregate resource flows to developing countries have nearly tripled in the last six years (Table 6). While official assistance has leveled off and even declined, private capital flows have grown from $44 billion in 1990 to $244 billion in 1996. Most of the increase is in the form of direct investment and purchases of marketable financial instruments. Commercial bank lending, which was dominant before the 1981 debt crisis, now plays a diminished role. In addition, repayments, interest, and profit repatriation have grown more slowly in recent years, resulting in an even faster growth of the net resource transfer.

Investment flows to emerging markets are small relative to the total volume of saving and investment in the industrial economies, which currently amounts to about $3 trillion per year. In principle, however,

[20] However, in a commercial context these countries are still small. They represent only about 20 percent of global production using commercial exchange rates, and an even smaller portion of world financial markets. Thus, there are significant limits on their ability to absorb large amounts of capital in the near term without causing some decline in the rate of return.

Table 6.
Net Resource Flows to Developing Countries, 1980 to 1996
Billions of U.S. Dollars

Type of Flow	1980	1990	1991	1992	1993	1994	1995	1996
Total Resource Flow	86.1	100.6	122.5	146.0	212.0	207.0	237.2	284.6
Official Development Finance	34.3	56.3	65.6	55.4	55.0	45.7	53.0	40.8
Total Private Flows	51.7	44.4	56.9	90.6	157.1	161.3	184.2	243.8
Foreign Direct Investment	5.1	24.5	33.5	43.6	67.2	83.7	95.5	109.5
Portfolio Equity Flows	0	3.2	7.2	11.0	45.0	32.7	32.1	45.7
Debt Flows	46.6	16.6	16.2	35.9	44.9	44.9	56.6	88.6
Commercial Banks	30.8	3.0	2.8	12.5	−.3	11.0	26.5	34.2
Bonds	2.6	2.3	10.1	9.9	35.9	29.3	28.5	46.1
Others	13.2	11.3	3.3	13.5	9.2	4.6	1.7	8.3
Interest and Profits	56.7	73.4	74.1	75.6	75.6	84.3	100.9	109.0
Net Resource Transfer	29.4	27.2	48.4	70.4	136.4	122.7	136.3	175.6

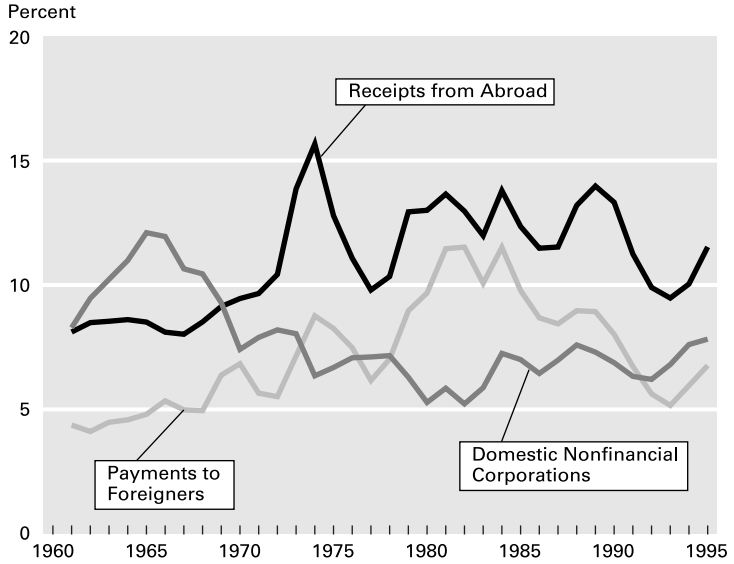
Source: World Bank (1997a).

investment in developing countries could represent a substantial part of any prospective increase in saving in the OECD. Looking ahead to the development of international capital markets over the next several decades, the recent growth in capital flows to emerging markets is very impressive. It is also worth noting that relatively large flows of saving from the rich to the poor economies occurred in the past. For example, Western Europe provided large international resource transfers to the rapidly developing economies in the half century before World War I.[21] Britain and the major continental European economies had current account surpluses that ranged between 5 and 10 percent of GDP. Comparatively large transfers also took place in the more recent past. Germany and Japan enjoyed surpluses equal to 4 to 5 percent of GDP as recently as the 1980s. Growing numbers of countries are eliminating capital controls, and diversification offers an increasingly effective method of responding to the exchange rate risk that distinguishes today's world from the gold standard era.

At the moment the idea of large resource transfers to the developing regions may seem farfetched. In recent years the OECD countries have actually run a current account *deficit* with the rest of the world, a pattern that is at odds with the common view of older wealthy nations as net creditors. Furthermore, the recent experience of rich countries with high saving rates generating substantial current account surpluses has not

[21] This experience is discussed more fully, with references, in IMF (1997, pp. 112–16). The manageable level of currency risk under the gold standard probably played a key role.

Figure 4
U.S. Rates of Return on Domestic and Foreign Investments, 1961-95



Source: Board of Governors of the Federal Reserve System (1995).

Note: Assets are measured at current replacement cost. Income is before payment of U.S. taxes. The return on foreign assets is measured as the factor income of the national accounts divided by the midyear average of the assets or liabilities reported in the Flow of Funds accounts.

been encouraging. When Japan's surplus of domestic saving over investment resulted in large trade imbalances, its government was subject to strong political pressure from the United States to eliminate public sector surpluses and promote domestic consumption. Nonetheless, many countries would welcome net capital inflows from the rest of the world, especially if they are accompanied by managerial and technical expertise that would make the investments highly productive.

U.S. investments in the rest of the world now total about $2 trillion at current, or replacement, cost. Foreign investments in the United States amount to about $4 trillion. Rates of return on those investments and returns in the nonfinancial corporate sector are shown in Figure 4. Over the 1991–95 period, U.S. investors earned an average of 10 percent on overseas assets compared with a 7 percent return on domestic corporate capital. Foreign investors earned 6 percent on their holdings in the United States. Those measures of the return on foreign assets may represent an overstatement because of the large statistical discrepancy between the flow and the stock data. It appears that U.S. investors have suffered significant capital losses on their investments, due to exchange rate

movements and other factors that are not reflected in the national income and product account concept of income earned from production.[22]

We can use our growth model and simple assumptions about the exchange rate mechanism to examine the implications of investing added U.S. saving overseas. Once again, we assume that net national saving rises by 1 percent of NNP in 2000 and remains at the higher level for the next 50 years. Under our initial assumption, the exchange rate is taken as fixed. By implication, the global demand for U.S. products is assumed to be highly elastic. Furthermore, U.S. overseas investments are assumed to earn a before-tax rate of return equal to that in our baseline simulation for capital in the domestic nonfarm business. In other words, foreign investments are not subject to diminishing returns. Whereas in the earlier simulation the additional saving was invested exclusively in the domestic economy, under these assumptions most of the added saving flows overseas.[23] We assume that the flow of foreign investments into the United States will be the same percentage of U.S. GDP as was the case in the baseline simulation. Thus, the bulk of the added investment is in the accumulation of assets in the rest of the world. However, the United States loses the taxes that would be earned on the investments if they were made domestically. We have assumed that the foreign tax rate is the same as for the domestic business sector, 25 percent.

The basic results under these assumptions are displayed in Table 7. The overall gain in national wealth is very similar to that reported for the case of domestic investment.[24] There is, however, essentially no increase in GDP as the gains accrue in the form of capital income earned from the rest of the world. The resulting gains in NNP and consumption are slightly smaller than in the earlier simulation because of the loss of tax revenues, but they have a similar pattern over time. The largest difference between the two simulations is the distribution of income gains across wage earners and owners of capital. Since there is no increase in the domestic business capital stock, wage rates and labor income remain essentially unchanged. All of the income gains are derived from higher flows of capital income from abroad.

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[22] This is evident if we deflate the annual flows to adjust for general inflation and cumulate the resulting flows. The estimate of the stock obtained on that basis is significantly larger than the real value of the reported stocks.

[23] Note, however, that additions to saving whether invested domestically or overseas will eventually boost U.S. net national income. This in turn will increase U.S. housing investment and government investment in public capital, because a wealthier nation will logically demand more of both kinds of capital. This kind of extra investment will occur whether the exogenous increase in U.S. saving is invested in the domestic business sector or overseas.

[24] The two simulations are not precisely equivalent because, while we have equated the return on foreign investment with that of nonfarm business sector, the domestic simulation has a more complex pattern of allocating capital among different classes of domestic assets.

Table 7
Economic Effects of a Permanent Rise in the Saving Rate, Invested Abroad, Assuming a Fixed Exchange Rate

Year	Wealth	Capital Services	GDP	NNP	Consumption	Rate of Return	Wage Rate
2000	.9	−.0	−.1	−.1	−1.2	.0	.0
2010	9.2	.0	.0	.8	−.3	.0	.0
2020	16.7	−.0	.2	1.7	.6	−.0	−.0
2025	20.4	−.0	.2	2.2	1.0	−.0	−.0
2030	23.8	−.0	.3	2.6	1.4	−.0	−.0
2040	30.2	−.0	.5	3.4	2.2	−.1	−.0
2050	36.6	−.0	.6	4.2	3.1	−.1	−.0

Note: Net saving rate raised by 1 percent of NNP beginning in 2000. All values are measured in constant prices.

These results may overstate the benefits of foreign investment in several respects. First, the assumed rate of return on overseas holdings may be too high. It is likely that returns on foreign investments would be subject to diminishing returns in the same way as additional investments in the domestic business sector. This would be particularly true if other aging countries in the OECD attempted to follow the same strategy of investing more of their saving abroad. In that case, the induced redistribution is between U.S. owners of overseas capital (who experience a reduced rate of return) and foreign workers (who benefit from a larger capital stock). Americans would still lose as owners of capital without enjoying offsetting gains as more productive workers. In comparison with the strategy of investing increased saving domestically, the strategy of investing abroad would produce higher returns on workers' pension fund investments, but it would eliminate the gain to workers' wages that accompanies an increase in domestic investment. In addition, since the policy would have no effect on wages, it would not increase future Social Security taxes or benefits. (In the U.S. Social Security system, real pension benefits are determined by past real wages.) If one's sole objective were to reduce the Social Security burden on future generations, foreign investment might be preferred because it would avoid an increase in some future benefit payments.

Second, we have assumed that the exchange rate would not be affected by the increased size of foreign capital flows. This is implausible. For U.S. savers to acquire overseas assets faster than foreign savers acquire U.S. assets, the required transfer of resources must be financed by increased net exports of goods and services from the United States. We should expect that this will require some reduction in the relative price of U.S. products, that is, a depreciation of the dollar. In subsequent periods, the exchange rate would be expected to recover as the capital inflows of

Table 8
Economic Effects of a Permanent Rise in the Saving Rate, Invested Abroad, Assuming a Variable Exchange Rate
Percent Change from Baseline

Year	Wealth	Capital Services	GDP	NNP	Consumption	Exchange Rate	Wage Rate
2000	.8	−.0	−.1	−.1	−1.7	−4.5	−.5
2010	8.8	.0	−.0	.8	−.4	−1.0	−.1
2020	16.4	−.0	.2	1.7	.7	1.8	.2
2025	20.3	−.0	.2	2.1	1.3	3.2	.3
2030	24.0	−.0	.3	2.5	1.8	4.4	.4
2040	31.3	−.0	.5	3.4	2.9	6.8	.7
2050	38.7	−.0	.7	4.2	3.9	9.1	.9

Note: Net saving rate raised by 1 percent of NNP beginning in 2000. All values are measured in constant prices.

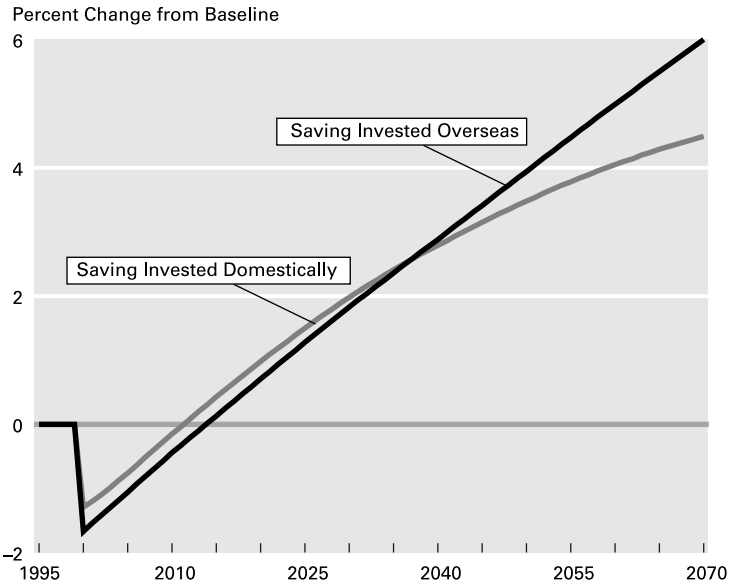
earnings on the overseas investments come to equal and later to exceed the annual capital outflows to other countries. In order to reflect the probable pattern of exchange rate movements, we assume that a change in the resource balance equal to 1 percent of GDP would be associated with a 5 percent appreciation of the currency. This represents a slightly higher degree of substitution between U.S. and foreign goods than was apparent in the large exchange rate swings over the 1980s. We measure the annual resource transfer as the change in net foreign investment minus the inflow of capital income—that is, as the change relative to the baseline in the balance of trade in goods and services.

The simulation results under the assumption of a variable exchange rate are displayed in Table 8. In comparison with our earlier assumption that exchange rates are fixed, exchange rate variability has only a trivial effect on aggregate income (NNP). The initial decline in the value of the dollar reduces the foreign currency value of the investment funds when they go out, but the effect is reversed when returns begin to flow back to the United States in large amounts in later years. Investors lose under these circumstances to the extent that the exchange rate appreciates over time.[25] The result is a change in the gains to NNP of a few hundredths of a percent after several decades (relative to the assumption of a fixed exchange rate).

Exchange rate flexibility has more significant implications for consumers, however. As the United States becomes a creditor nation, the surplus on the capital account must be offset by a growing net trade inflow. Since the United States is exporting less, its products become

[25] We assume no anticipation of future exchange rate movements by investors, and no smoothing of the exchange rate movements.

Figure 5
Change in Consumption with 1-Percent Rise in Net Saving



relatively scarce on world markets, driving up their price. The appreciation of the real exchange rate, which amounts to 3.2 percent by 2025, implies a significant terms-of-trade gain for U.S. consumers. Using the current proportion of imports in consumption, overall consumption prices might decline by about one-tenth of any reduction in import prices. Thus, American consumers would have an additional gain of about 0.3 percent in 2025, which is reflected in the increased real wage. This suggests that changes in exchange rates and the terms of trade are likely to be a significant element in any evaluation of the net benefits of an increase in national saving.

The net implications of a policy of investing abroad versus domestically are summarized in a simple way by the comparison of the aggregate consumption gains shown in Figure 5. Investing abroad would initially yield a larger reduction in consumption because of the loss of tax revenues, but it would avoid the diminishing returns that are likely to be an important feature of any large-scale increase in domestic investment. The gain in terms-of-trade also offsets some of the tax loss in the long run. While the foreign option looks slightly less attractive in the short run, it yields larger consumption gains after about 40 years.

While our analysis is highly simplified and based on extreme

assumptions about future exchange rate movements and rates of return on overseas capital, it nonetheless illustrates the important consequences of a shift in the composition of investment in favor of foreign holdings. Although the developing economies may seem too small to absorb large flows of future capital, the rising demand for capital in those parts of the world is more significant when viewed at the margin as an offset to the slowing of labor force growth in the industrial economies.

Conclusion

All of the major industrial countries will experience substantial population aging over the next several decades. While the projected rise in the aged dependency ratio is lower in the United States than in other rich countries, it will still represent a sharp increase from today's level. The cost of financing income transfers and medical care for the elderly will place major pressure on public sector budgets at a time of reduced growth or actual decline in the size of the work force. Population aging also raises concerns about private saving behavior in the advanced industrialized economies and international flows of capital between aging rich countries and younger developing countries. While aging is an issue of common concern, however, significant differences are found in the size and timing of the demographic changes among the rich countries. The implications for public sector budgets also differ across countries because of large differences in the structure of public transfer programs for the elderly.

Population aging raises two kinds of questions about investment and saving in the industrial economies. First, what would be the effects of aging on investment and saving in the absence of any public policy change? Second, what is the optimal policy response to prepare the industrial countries for a future with much older populations? Population aging has two sources, longer life spans, which increase the proportion of life spent in retirement, and lower birth rates, which have reduced and will continue to depress the rate of labor force growth. Longer retirements should boost workers' desired saving rate and, in the short run at least, push up aggregate saving in the industrialized countries. Slower labor force growth should reduce investment opportunities in the rich countries and reduce their demand for investment.

If each aging country were a closed economy, investment–saving balance would require that changes in the investment rate match changes in saving. The availability of international capital markets permits rich countries to save more than they invest domestically, however, opening the possibility that their increased willingness to save could be accommodated without serious erosion in the rate of return on capital. Whether the risk of investing internationally is small enough or the absorptive capacity of international capital markets is large enough to permit rich

countries to save huge amounts overseas remain open empirical questions.

The public policy issue is also important. For most industrialized countries the projected public-sector costs of population aging are so large that many will be forced to make significant changes in the structure of programs that provide income and health care support for the elderly. In this paper, we have considered one possible change in public policy—a significant and sustained increase in the net national saving rate. Using a simple neoclassical growth model, we examined the effects of this policy on future income, consumption, wages, and rates of return, and we showed how these effects differ depending on whether the increment to saving is invested domestically or overseas. The results suggest that a sizable increase in saving would be needed to offset the burden on future workers of financing the extra spending on public programs for the aged. An increase in the net national saving rate of more than 2 percent of NNP—an increase of 40 percent above the current rate—is needed to boost future consumption by enough to pay the extra costs predicted by the Congressional Budget Office.

A policy of higher saving would be successful in offsetting some of the future burden of population aging, whether the extra saving is invested at home or abroad. But the distributional consequences of the two alternatives differ markedly. If the added saving is invested in the domestic business sector, rates of return will be driven down and owners of old capital will experience large losses. Workers, on the other hand, will enjoy significant real wage gains as a result of higher labor productivity. If all or most of the extra saving flows overseas, the rate of return will not fall as much, but U.S. workers will be denied the productivity gains they would have experienced if the saving had been invested domestically. Instead, foreign workers will enjoy higher wages as a result of capital deepening in overseas economies.

Our policy simulations are not intended to offer exact predictions of future incomes, wages, or rates of return. They highlight the trade-off between near-term consumption sacrifices and future consumption gains that can offset the burden of supporting a larger retired population, and they show how this trade-off is affected if increases in saving can flow overseas. A useful extension of the analysis would explicitly measure the costs and benefits of higher saving for different birth cohorts. It would also model more precisely the public policy that generates an increase in national saving. A policy that forces workers to boost their saving in private, individual pension accounts will have very different distributional consequences than one in which the extra accumulation takes place in a single public fund. Both the private and the public strategies can raise saving and future incomes, but only to the extent that they induce some sacrifice of consumption in the near term. The crucial question for voters and policymakers is whether the near-term sacrifice is worth the long-term gain.

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Discussion

Estelle James*

This paper by Barry Bosworth and Gary Burtless starts by outlining the large fiscal burden that we will face in the United States over the coming decades as a result of population aging, and the costs population aging imposes on Social Security, Medicare, and Medicaid. Spending on these three programs will double as a proportion of GDP by 2025—from 8 percent to 15 percent. Spending increases may be greater yet when we take into account that per capita medical costs are highest and accelerating most rapidly for the "very old" (over 80) age group, which will grow fastest during this period. These expenditures on pensions and medical care will be large in the aggregate whether they are borne by the public or the private sector. In either case, a smaller proportion of national output will be left for the working-age population to consume. But if the costs are borne by the public sector (as currently structured), they will lead to huge budget deficits—9 percent of GDP by 2025. These deficits will probably far exceed total national saving and/or will require large tax increases—neither of which is desirable or sustainable.

A faster rate of economic growth might help to get us out of this difficult situation. Bosworth and Burtless ask whether increased national saving will stimulate growth and provide the extra resources that are needed for an aging population. The good news coming out of this paper is that increased saving will indeed lead to growth that potentially could generate these resources. The bad news is that growth will not automatically solve the fiscal problems associated with Social Security, Medicare, and Medicaid. Additional measures, such as increased taxation or cost

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shifting to the private sector, will be needed to direct the resources to these uses.

In this comment I first examine the two sets of simulations in the paper that calculate the impact of increased saving when it is domestically invested or invested abroad. I then proceed to draw some implications for Social Security reform.

Saving, Growth, and Social Security Costs

Domestic Investment

Some analysts have claimed that if our national saving increases substantially we will face a glut of capital, causing rates of return to fall, so that output will not grow; that is, capital markets will be unable to absorb the increased saving. Bosworth and Burtless investigate this issue by assuming that net national saving increases by 1 percent of net national product (NNP) and simulating the long-term impact on rates of return, wages, output, and consumption. The increased saving does indeed cause a large fall in the rate of return, but output and consumption increase nevertheless, because worker productivity and wages increase. By 2025 the rate of return has fallen by 20 percent but wages have increased by 6.5 percent, NNP by 3.4 percent, and consumption by 1.9 percent. These changes all roughly double by 2050. The effect on growth, thus, is not huge, but it is positive and substantial—enough to cover half of the projected deficit increase. This is the good news.

But now the caveats: Either a tax increase or a shift of financial responsibility to the private sector will be needed to mobilize these extra resources for pensions and medical care; in the absence of either policy change, the government's fiscal deficit remains despite the more rapid growth. On the one hand, some improvement occurs because of the use of price rather than wage indexation of pensions. But on the other hand, the deficit may actually grow since demand for medical services is income-elastic. And, the large drop in the rate of return may lead to an outflow of foreign capital, offsetting the increase in domestic saving, so on balance capital and productive capacity may grow much less than estimated by these simulations.

Investment Abroad

In a second set of simulations, the paper analyzes what will happen if all the increased savings are invested abroad, rather than in the domestic economy. In this case, the rate of return does not fall at all, domestic workers gain only slightly (under a flexible exchange rate regime), but consumption increases more than in the first scenario. Big winners are the holders of capital and foreign workers, whose produc-

tivity rises. The basic reason for this outcome is that other countries, particularly in the developing world, have much younger populations and lower capital–labor ratios than we do, so savers can obtain a higher rate of return without diminishing returns if they invest abroad. Is this assumption realistic? At least three counteracting forces are at work.

First, other countries may also increase their national saving for very similar reasons—the desire for a higher growth rate as the population ages. All the OECD countries will age over the next few decades, most of them more rapidly than the United States. With this in mind, Australia, Denmark, and the United Kingdom have changed their pension systems to include funded arrangements that are mandatory and privately managed. Moreover, with the exception of Africa, most developing countries are aging much more rapidly than are industrialized countries, and they are setting up mandatory pension funds that rely partially on pre-funding, to forestall the increased payroll tax rates and intergenerational redistributions that would otherwise occur. For example, most of the Latin American countries have followed the Chilean model (with some variations) and established large, privately managed funded pillars in their mandatory systems. Included here are Argentina, Colombia, Peru, Uruguay, Bolivia, and Mexico. Several Central American countries (for example, El Salvador) are on the verge of following suit. The Asian countries, realizing that they will age rapidly over the next three decades as a result of decreased fertility and increased longevity, are all moving toward partially funded systems. China, for example, has made the decision to do so, although it is having difficulty in implementing this decision in some cities. In Eastern Europe and the former Soviet Union, Hungary, Poland, and Kazakhstan have introduced pension reform legislation that includes funding, while Russia, Slovenia, and Latvia are now developing such legislation. I expect a domino effect in this region over the next five years. The spread of mandatory funded pension plans may increase global saving and decrease rates of return, regardless of whether or not the United States saves more and invests abroad.

Second, we find in China and India hundreds of millions of prime-age adults who have not yet entered the formal nonagricultural labor market and are working with little or no capital today. Over the next 50 years we can expect that most of them will leave agriculture for formal jobs in industry or the service sector, where they will have easier access to capital and where the potential value added by capital will be much greater. This could provide huge opportunities for productive capital investment and could increase the global rate of return.

Finally, these very countries do not offer free movement of capital and goods. Their economic and political risks are great. They increase transactions costs associated with international finance, avoid trade deficits, limit capital mobility, and sometimes direct capital to relatively

nonproductive uses, all of which will reduce the ability of savers to earn the high potential rate of return.

On balance, despite the high degree of uncertainty about precise magnitudes, I believe it is safe to assume, as do Bosworth and Burtless, that diversified international investment will continue to yield a return that is higher than the domestic return. From the global point of view, this strategy maximizes output, and from the national point of view it appears to maximize consumption, but almost all of these gains accrue to savers rather than domestic workers. Note that the payroll tax is particularly ill-suited to capture the growth dividend for Social Security and Medicare, since all the income growth accrues to capital and not to labor.

The fact that savers are the chief beneficiaries could lead to a highly unequal distribution of income, unless workers are also the savers. If we care about equalizing income distribution, this is a reason why we might encourage or even mandate that workers save more—as through a mandatory saving component to Social Security.

What Are the Policy Implications for Social Security Reform?

Bosworth and Burtless conclude their paper by asking whether it is worthwhile to cut consumption in the short run in order to increase consumption in the long run. Will people be made better off by saving more even though they do not want to do it—so perhaps we should force them to do it? I think the answer is "Yes."

First, people may not be saving enough for their own good, because of myopia and lack of information—about their future needs, increased longevity, probable Social Security benefit cuts, and tax increases. Ricardian equivalence may not hold for many people and the social discount rate may be lower than the private, for these reasons. Second, through the corporate income tax and the income tax on interest and dividends we have placed a large tax wedge between the marginal productivity of capital and the private return from saving, a wedge that probably discourages optimal saving. And third, saving-induced growth makes it easier for us to generate the resources to combat poverty and inequality—a kind of social externality that is not taken into account by individual decision-makers. For these reasons, I believe that we would be better off, in the Pareto-optimal sense, if national saving increased—that is, the extra consumption we will get tomorrow is worth more than the consumption forgone today.

If we want to increase national saving, should Social Security be used as the instrument? It is frequently pointed out that national saving could be increased in other ways, for example, by running a budget surplus. While not discounting these other ways, I would nevertheless argue that Social Security should be reformed to have a positive saving impact.

From the economic point of view, it appears that funded social security systems can increase saving, and from the political point of view, this may be a particularly plausible instrument since people can easily be made to see the rationale for saving for their own old age. Thus, the analysis in this paper has direct relevance for the argument that Social Security reform should have increased saving as one goal.

Adding a mandatory, funded defined-contribution component to Social Security may be one way to increase saving, and several reform proposals would do exactly that. This has the added advantage that, as noted above, it would make workers into savers who would therefore share in consumption growth whether investments are domestic or international. But a few caveats are in order here, too.

First, on the magnitudes involved: The 1 percent of NNP increase in saving posited by the paper produces only modest consumption gains; anything less would be trivial. But this translates into a payroll tax of 3 or 4 percent, given that taxable earnings are less than half of national income and part of the mandated saving would simply crowd out voluntary saving. A smaller increment in payroll tax is likely to have only a negligible impact on saving and growth.

Second, on the implications for structure: An increment of this size could easily accumulate to over 50 percent of GNP before an equilibrium is reached where withdrawals for old-age income equal new saving. This would be a large share of the total capital stock in the economy. Given the dangers of political rather than economic objectives determining capital allocation, we probably would not want a capital stock of this size to be managed by the public sector. Hence the large magnitudes push us in the direction of private rather than public management of the mandatory pension funds. Moreover, the development of privately managed defined-contribution accounts would shift some of the responsibility for old-age security away from Social Security, reducing the fiscal deficits projected for the future. In fact, this is one way to capture some of the increased growth in order to reduce the government's budgetary problem.

Third, on distribution: If individual retirement saving accounts are mandated, this is likely to decrease voluntary saving or increase consumer dissaving through borrowing—among those to whom liquidity constraints do not apply. Thus, the net saving position and perceived welfare of the upper half of the income distribution is unlikely to change much. However, the bottom half of the distribution probably face liquidity constraints that do not permit them to offset saving or increase borrowing. This is the group whose net saving will increase. Forcing them to save increases national saving and growth, but they will perceive themselves to be worse off because they are compelled to do what they do not want to do and because their discount rate is particularly high. I would argue, therefore, that if such a policy of mandatory saving is adopted (which I hope is the case), it should be accompanied by sharp

changes in the tax and benefit structure of the existing Social Security system, designed to compensate the lower half of the income distribution who will perceive themselves to be the losers. Such compensation could take the form, for example, of benefit cuts at the top end to reduce Social Security expenditures or exemption from the payroll tax (but not from benefit credits) of wages at the low end, offset by an increase in the taxable earnings ceiling, to maintain revenue neutrality.

In sum, I found the paper by Bosworth and Burtless to be both useful and provocative. By quantifying the gains from increased saving, it provides a rationale for Social Security reforms that will have this effect. In my view, this means increased contributions for funded accounts, private management of the funds, and compensating policies to offset welfare losses to low-income groups.

Discussion

Charles Lieberman*

As is well known, the governments of most developed economies have huge unfunded pension and medical benefit liabilities that will become extremely burdensome over the next few decades, given the age mix of their populations, lengthening life spans, and low or falling birth rates. Barry Bosworth and Gary Burtless would like to support a shift from pay-as-you-go into a fully funded savings plan. But citing the "golden rule" of growth theory, they recognize that such a large incremental supply of savings would depress market rates of return, which would be counterproductive. To avoid this outcome, Bosworth and Burtless globalize their model. This helps, but still leaves many difficult issues.

According to the authors, a substantial rise in saving would have very different effects depending on whether the proceeds are invested domestically or overseas. If invested domestically, higher savings would raise wages, while lowering rates of return. If invested overseas, rates of return are assumed to be unaffected, but domestic real wage rates do not benefit from a rising capital–labor ratio, so they are essentially unaffected as well. These results are probably all that can reasonably be expected from a simple tractable model, but they are neither satisfying nor convincing, given the inherently high degree of uncertainty with respect to each part of the analysis.

Moreover, Bosworth and Burtless's assumptions or modeling conflict markedly with actual policy behavior of many nations. All too often, governments tightly control access to investment outlets within their domestic markets. In addition, the real world is complex and sloppy. Inconveniently, data do not measure well the variables crucial to the

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analysis; economies can deviate from general equilibrium for lengthy periods; and calibrating models used in simulations is very difficult when simple models fail to capture many interesting aspects of behavior. This makes coming to any firm conclusions rather difficult. The authors should be thanked for an excellent effort, but much remains to be done.

Broad Issues

Bosworth and Burtless start by pointing out three solutions to the unfunded pension obligations: cut benefits, raise taxes, or shift to pay-as-you-go if rates of return are higher than the saving rate. In fact, the last "solution" is incomplete, because it does not handle the transition problem. If the young are permitted to save for their own retirement in a fully funded scheme, how does society pay for providing benefits to those about to retire for whom nothing has been saved?

A few years ago, when I was somewhat younger, I would have been willing to forgive all of the benefits due me under the existing Social Security system, if I had been permitted to save for my own retirement in an account protected from taxes and politics. Market returns compounded over three decades on such retirement savings would have more than compensated for the forgone benefits to which I was already entitled. Given the passage of time, that is no longer assured. Others a little older than I would surely be unable to do this, because they could not possibly save enough to retire at age 65. The authors do not address this issue, although it is a significant hurdle to adopting a fully funded retirement program.

Additional problems are associated with the fully funded retirement program. Under such a scheme, saving would rise considerably, depressing rates of return sharply, as recognized by Bosworth and Burtless. And if rates of return fall enough, saving would need to rise considerably more to fund retirement. This is a classic insight from the "golden rule" of growth theory.

The authors try to repeal the constraint of the golden rule in two different ways in order to maintain high expected rates of return on savings. One of the solutions they offer amounts to assuming the economy is operating below the optimal saving rate. In this case, saving can rise without overly depressing market rates of return. That is probably true, but hardly certain, especially not for the huge increase in saving implied by a shift into a pay-as-you-go scheme. And, it amounts to simply assuming away the problem. If we are operating below but close to the golden rule for saving, more saving to finance domestic investment would not solve the funding problem at all.

Bosworth and Burtless globalize their model as the second solution to breaking the constraint of the golden rule. In a global context, savings can go offshore and, if the international capital market is deep enough,

incremental saving will not lower global rates of return very much. After all, the developed OECD countries are rich, so they have lower investment opportunities, lower rates of increase in productivity, and lower rates of return on investment than in the developing world. So, it follows that mature rich economies should channel savings into the less developed countries (LDCs), where the rates of return are considerably higher, perhaps.

It is not at all clear that China, Brazil, and other LDCs can productively absorb a substantial rise in direct foreign investment, especially if a number of other unfunded OECD nations also adopt fully funded programs. That would probably supply an avalanche of capital on a global scale. Bosworth and Burtless acknowledge this. In the end, they hope that such capital outflows will not drive down rates of return too much, although this is hardly a convincing solution to the funding problem. Moreover, while they recognize that LDCs might not be able to absorb such a large rise in capital inflow, they never ask whether LDCs would permit such large influxes of foreign investment.

In fact, the typical LDC, especially in Asia, has chosen to protect "critical" domestic markets, contrary to the policy implications of trade theory, which suggest they should run open, highly competitive economies. Instead, many LDCs use a slightly undervalued currency to boost exports into the vast global market, using foreign demand as the engine driving developmental growth. This strategy requires these LDCs to run trade surpluses which, given basic accounting rules, means they must invest overseas. One consequence of this development model is that many LDCs have been accumulating massive sums of the sovereign debt of the OECD countries, despite the low rates of return available on bonds compared with the higher rates of return available on direct investment in their own economies. The governments of these developing economies accept low-return financial investments so that their business sector can remain highly competitive globally and they use the relatively vast foreign market to absorb rising domestic production. South Korea, Taiwan, Malaysia, Thailand, and China are just some of the countries that have played this game.

Basic textbook theory implies that protected domestic markets, capital controls, or other nonmarket constraints are a suboptimal way to promote development. No matter. Other objectives appear to be at work. This development model also allows politicians to develop a symbiotic relationship with local businessmen (sometimes they are one and the same), thereby earning their political and monetary support. In fact, some of these countries have achieved such rapid rates of growth that it is hard to fault them or claim that a less manipulated system would have worked even better. Typically, these governments are very pleased with their success.

This brings us to Japan, the originator of this developmental model and the best example of how the model eventually breaks down when pushed to the extreme. A protected domestic market, high domestic

prices, constrained housing, and other unusual characteristics helped produce a very high saving rate that financed domestic investment to produce goods for export. But the growing trade surpluses kept pushing the yen higher, despite government intervention and jawboning, until Japanese goods became uncompetitive in global markets. By 1995, economic conditions in Japan had become extraordinary, as the country enjoyed a modern, highly efficient capital stock that was uncompetitive in the global marketplace because of an outrageous overvaluation of the yen. And once the engine for growth turned off, the country was no longer able to outgrow its poor business practices. The most obvious lesson provided by the Japanese experience is that such policies will not work in the long run if they fail to take account of market forces.

Bosworth and Burtless do not fall into this trap. Instead, they globalize their model to take market forces into account to (try to) prevent higher saving from overly depressing market rates of return. However, they can do little to take account of the likely unwillingness of LDCs to absorb so much foreign investment. If the LDCs remain highly protective of their financial institutions or constrain foreign capital inflows, the most lucrative outlets for capital outflows would be closed. Thus, the protective policies of LDCs could be a significant constraint on those OECD nations that adopt a fully funded retirement program. Globalizing the model might work in theory, but less well in practice.

Alternative Solutions

Raising the growth rate of output for the economy would serve as yet another alternative to raising taxes or cutting benefits to meet funding needs. A higher growth path implies that more income will be available to be taxed at current rates, thereby reducing the funding gap. If only we knew how to do so. There is precious little evidence that government programs to promote technological innovation actually increase productivity beyond that which the private sector is doing on its own.

Government support programs to promote innovation may, in fact, be quite useful, but we fail to appreciate the benefits because of measurement problems. Indeed, it is widely claimed that productivity growth has accelerated in recent years, but we just cannot measure it well enough to verify whether such assertions are valid.

I personally favor government spending on research and development and research grants because I suspect they do add something to growth in the long term, although I am delighted not to have to provide hard evidence to this effect. While incremental government spending on research might help boost growth, such spending would also be subject to diminishing returns, so it is highly unlikely that a major initiative to fund research would affect the rate of productivity growth by more than a minimal amount. In addition, if faster growth does occur, the increased

revenues must be used to meet the unfunded pension obligations (unlike the latest budget accord, which used a positive revenue surprise to fund incremental tax cuts and spending increases). This approach is unlikely to solve the funding problem.

Can We Change the Theoretical Framework?

The "golden rule" result comes from a model in which productivity is stable or improves at a steady pace and capital is homogeneous. However, these simplifying assumptions may be quite far from the truth, particularly the homogeneous capital assumption, which is manifestly not the case and appears to be deviating ever further from reality. So, perhaps rates of return will not fall as much as feared.

In the United States, capital investment is becoming progressively more concentrated in high technology equipment. These items have very high rates of depreciation and obsolescence because the technology is advancing so rapidly. As a result, it is easy to tell two diametrically opposite stories about U.S. investment, a very positive one when using gross investment as a fraction of GDP versus an apparently very negative story implied by a low level of net investment relative to GDP. Both conclusions cannot be right. Clearly the mix of investment matters. High-tech investment makes "old" capital more flexible and productive. With a dose of technology, old clay investment turns into malleable putty. This reduces the need for net investment, which frees up more output for current consumption. And it may help account for some of the decline in the saving rate. But it is not at all obvious that increased saving can be absorbed effectively by an already rapidly advancing high technology sector.

How else can the funding gap be closed? Policy changes that promote greater economic efficiency would certainly help. If the non-accelerating inflation rate of unemployment, the NAIRU, could be reduced, the trajectory of GDP growth would be higher permanently. This would create a permanent incremental stream of revenues. But, a change in the NAIRU of about 1 percent or so of GDP would be a major economic development, while most pension shortfalls are multiples of this amount.

Narrow Issues

Like all model testing, Bosworth and Burtless's empirical work is dependent on the quality of their data. This is particularly risky in their case, because they must rely on data from markets that are manipulated and out of long-term equilibrium. This is especially true when the tests are simulations run to mimic actual market data.

Calibrating simulations and testing models with real world data are dangerous if the measures are inadequate. Theory is often complex, so weak empirical tests can provide incorrect or misleading answers. An

example of conflict between real world complexity and model testing is the behavior of saving in the United States against the life-cycle model, which is cited by Bosworth and Burtless. In a simple version of the theory, rising life expectancy and earlier retirement should boost the saving rate to provide the incremental funds needed for a lengthier retirement period. The authors note that theory implies a rising saving rate, but actual saving rates have declined throughout the OECD. So, Bosworth and Burtless criticize the life-cycle model because it does not fit the data. But this is much too casual an observation to serve as a valid test of the model. Government promises of pensions should offset the need for private savings, and higher-than-expected rates of return on private portfolios allow for higher current consumption, cutting into the saving rate. Unraveling these conflicting effects is not easy, and the authors were perhaps too hasty in dismissing the life-cycle model.

Conducting valid tests is especially difficult when the data are just bad. In the United States, Gross Domestic Income increased at a 3.7 percent rate between the fourth quarter of 1995 and the fourth quarter of 1996, while Gross Domestic Product rose at a 3.1 percent rate. The gap between the two, the statistical discrepancy, has exploded from −$43.3 billion to −$84.5 billion over this one-year period. This is an enormous difference, and one that the rumor mill suggests will *not* be eliminated by the upcoming annual July benchmark revision to the Income Accounts. If the income side is correct, savings are greatly overstated, as might be expected in response to a rise in stock prices, which theory indicates would induce a large wealth effect. In any case, a lengthening life span and a rise in wealth have theoretically opposite effects on the saving rate, so the net effect is ambiguous.

Indeed, real world complexity is often hard to anticipate fully in offering public policy recommendations. For example, the primary solution offered by Bosworth and Burtless to meet the unfunded liabilities is to boost GDP growth by encouraging more saving and investment. They focus on one aspect of the problem, namely that higher investment may not produce the necessary return.

However, if higher saving and investment do boost productivity and yield a permanently higher trajectory for GDP, incomes would rise and people would feel richer. This would increase the demand for luxuries, including the demand for medical care and leisure time, perhaps encouraging earlier retirements. These effects would worsen the funding shortfall. At best, it becomes a receding target.

So, it seems that any solution really comes back to cutting benefits, raising taxes, or lifting productivity and hoping that the incremental growth does not raise retirement demands or government spending as much as it raises funding. At the end of the day, governments really cannot provide greater retirement benefits than society can afford, even if they all too often promise far more.