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Social Security, Demographic Trends, and the Federal Budget

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Abstract

This paper considers the implications of the prospective aging of the U.S. population for the social security system and concludes that the large and growing cashflow surpluses of the social security trust funds should be saved to help insulate living standards against this change. A number of illustrative scenarios are presented in which the impact of pursuing this policy is analyzed within the context of a growth model incorporating the demographic projections of the Social Security Administration. If the current unified budget framework, which includes Social Security trust fund flows, is retained, the suggested policy would require that fiscal surpluses be achieved.

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Summary

In the United States the fiscal deficit is measured on a unified budget basis, which includes the operations of the social security trust funds. For demographic reasons--notably, the passage of the "baby boom" generation into its years of high earnings capacity--these funds are running growing cashflow surpluses that could reach about \$500 billion annually around 2015. Despite the growth in recent years of the social security trust fund cashflow surpluses, the federal fiscal deficit in the United States has remained substantial, contributing to the persistence of the low national saving rate. This trend raises concerns particularly because, as the baby boom generation ages, the cashflow surpluses will give way to large and growing deficits. This paper considers both the fiscal and the national saving implications of the interactions between prospective demographic trends and the social security system.

The paper focuses on the economic issue of how the social security system influences individual economic behavior, rather than on the accounting issue of how the federal fiscal deficit should be defined. The complex relationship between a typical individual's contributions and benefits under the social security system has resulted in a number of approaches to modeling the economic impact of social security on households. Loosely, these approaches range from viewing social security as just another tax transfer scheme to emphasizing its potential role as a pension plan.

The principal conclusion of the paper is that a strong economic case can be made irrespective of the model employed for "saving" the social security surpluses. In a unified budget framework, that would imply running fiscal surpluses in the amount of the social security surpluses. Such a policy would serve to increase the ability of the United States to insulate its economy from the prospective demographic shock.

To provide some sense of the magnitudes involved, the paper also presents a number of scenarios in which the impact of saving the social security surpluses is analyzed within the context of a growth model using demographic and other relevant economic data drawn from the projections of the Social Security Administration. The scenarios show that saving the social security surpluses would have a positive impact on output and consumption over the long run and thus provide a useful buffer against the prospective demographic shock.

The paper also considers the role of public pension plans, specifically military, civilian, and state and local government plans, and suggests, though on somewhat different grounds, that the surpluses of these programs also be "saved." In effect, this already occurs in the case of state and local plans.

I. Introduction

The national savings rate--whether defined in gross or net terms--has declined substantially in recent years. ^{1/} While a significant part of this decline was due to a fall in the private savings rate as shown in the tabulation below, the emergence of large and persistent measured fiscal deficits also was important. The U.S. authorities have responded to these developments by adopting a number of measures to reduce the Federal Government's fiscal imbalances. Currently, the centerpiece of these efforts is the Balanced Budget and Emergency Deficit Control Reaffirmation Act of 1987 (the revised Gramm-Rudman-Hollings (GRH) Act) which envisages that the federal fiscal deficit, measured on a unified budget basis, will be reduced progressively to zero by fiscal year 1993.

Savings Rates

| | <u>Gross Savings</u> | | | <u>Net Savings</u> | | |
|---------|----------------------------------|---------------------------------|---|---|---------------------------------|---|
| | <u>National</u> <u>Saving</u> | <u>Private</u> <u>Saving</u> | <u>Federal</u> <u>Govern-</u> <u>ment</u> | <u>National</u> <u>Saving</u> | <u>Private</u> <u>Saving</u> | <u>Federal</u> <u>Govern-</u> <u>ment</u> |
| | <u>(In percent of GNP)</u> | | | <u>(In percent of net</u> <u>national product)</u> | | |
| 1950s | 16.1 | 16.2 | 0.1 | 8.1 | 8.2 | 0.1 |
| 1960s | 16.3 | 16.6 | -0.3 | 8.6 | 8.9 | -0.3 |
| 1970s | 16.7 | 17.6 | -1.7 | 7.9 | 8.9 | -1.9 |
| 1980-88 | 14.1 | 16.7 | -3.9 | 3.4 | 6.3 | -4.4 |
| 1985 | 13.3 | 16.6 | -4.9 | 2.7 | 6.4 | -5.5 |
| 1986 | 12.7 | 15.8 | -4.9 | 1.7 | 5.6 | -5.4 |
| 1987 | 12.2 | 14.7 | -3.6 | 1.7 | 4.4 | -4.0 |
| 1988 | 13.2 | 15.1 | -3.0 | 2.9 | 5.2 | -3.3 |

The unified budget deficit includes the operations of the social security trust funds. ^{2/} As can be seen from the tabulation, these trust funds are expected to run large and growing cashflow surpluses, thereby greatly facilitating the achievement of the GRH targets.

^{1/} Net saving is defined as gross saving less capital consumption allowances.

^{2/} The nature of the social security trust funds and their relationship to budgetary accounting is detailed later.

Social Security and the Federal Deficit

(Billions of dollars)

| <u>Fiscal Years</u> | <u>Administration Current Services 1/</u> | <u>Social Security 2/</u> | <u>Remainder</u> | <u>Revised GRH Targets</u> |
|-------------------------|---|-------------------------------|------------------|--------------------------------|
| 1989 | -160 | 56 | -216 | -136 |
| 1990 | -127 | 68 | -195 | -100 |
| 1991 | -102 | 79 | -181 | -64 |
| 1992 | -70 | 90 | -160 | -28 |
| 1993 | -37 | 103 | -140 | -- |

Major demographic trends underlie these cashflow surpluses. Specifically, the surpluses reflect the fact that the post-World War II "baby boom" generation is now entering its years of peak earnings, bolstering social security revenues. However, as this generation ages and retires, the proportion of the U.S. population that is working can be expected to decline (Chart 1). In fact, by some projections the absolute level of the labor force will decline starting around 2010 (Chart 2). This major demographic shift will have the effect of transforming social security's cashflow surpluses into deficits, as the growing number of retirees draw on the system. ^{3/}

These demographic trends and associated developments in the social security trust funds raise a number of policy issues. This paper considers both the national savings and the fiscal implications of the potential interactions between the prospective demographic trends and the social security system. It will be argued that the implications of these interactions depend significantly on how the operations of the social security trust funds influence the path of other federal expenditures and taxes. If the Government uses the prospective cashflow surpluses of the trust funds to defray current expenditures (or reduce current revenues) then the result may be both for a path of wealth accumulation which takes inadequate account of prospective demographic changes and for increased taxation of the next generation.

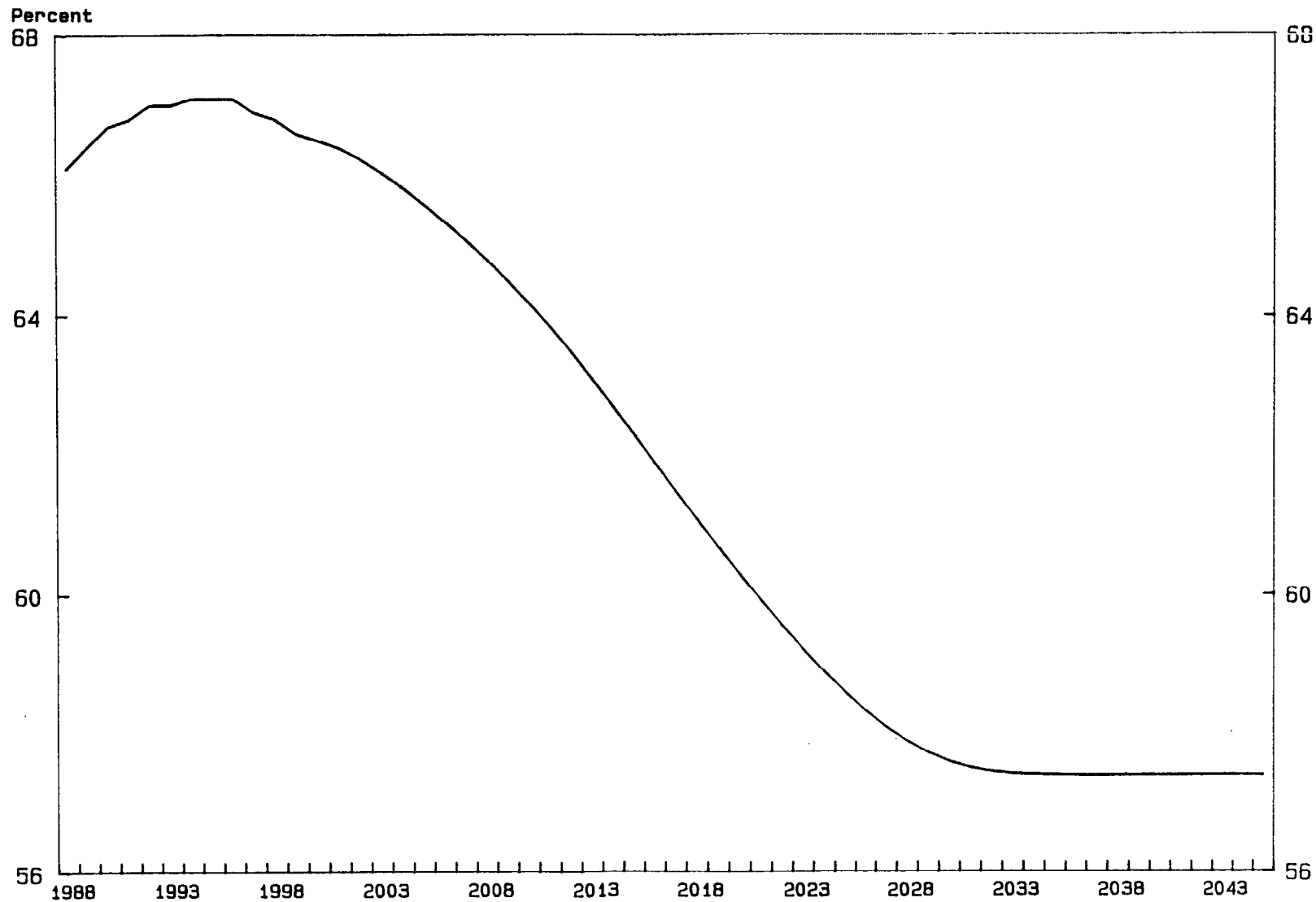
The paper supplements the analysis with a number of scenarios developed within a neoclassical growth framework, so as to estimate the orders of magnitude of the impact of the prospective demographic changes and of possible policy measures. These scenarios indicate that the prospective demographic changes, *ceteris paribus*, could have a major impact on the long-term path of per capita consumption. They also demonstrate the potential for increased national saving in providing

^{1/} Budget of the United States Government, FY 1990, Special Analysis.

^{2/} Congressional Budget Office, The Economic and Budget Outlook: Fiscal Years 1990-1994, January 1989.

^{3/} See also Heller (1989).

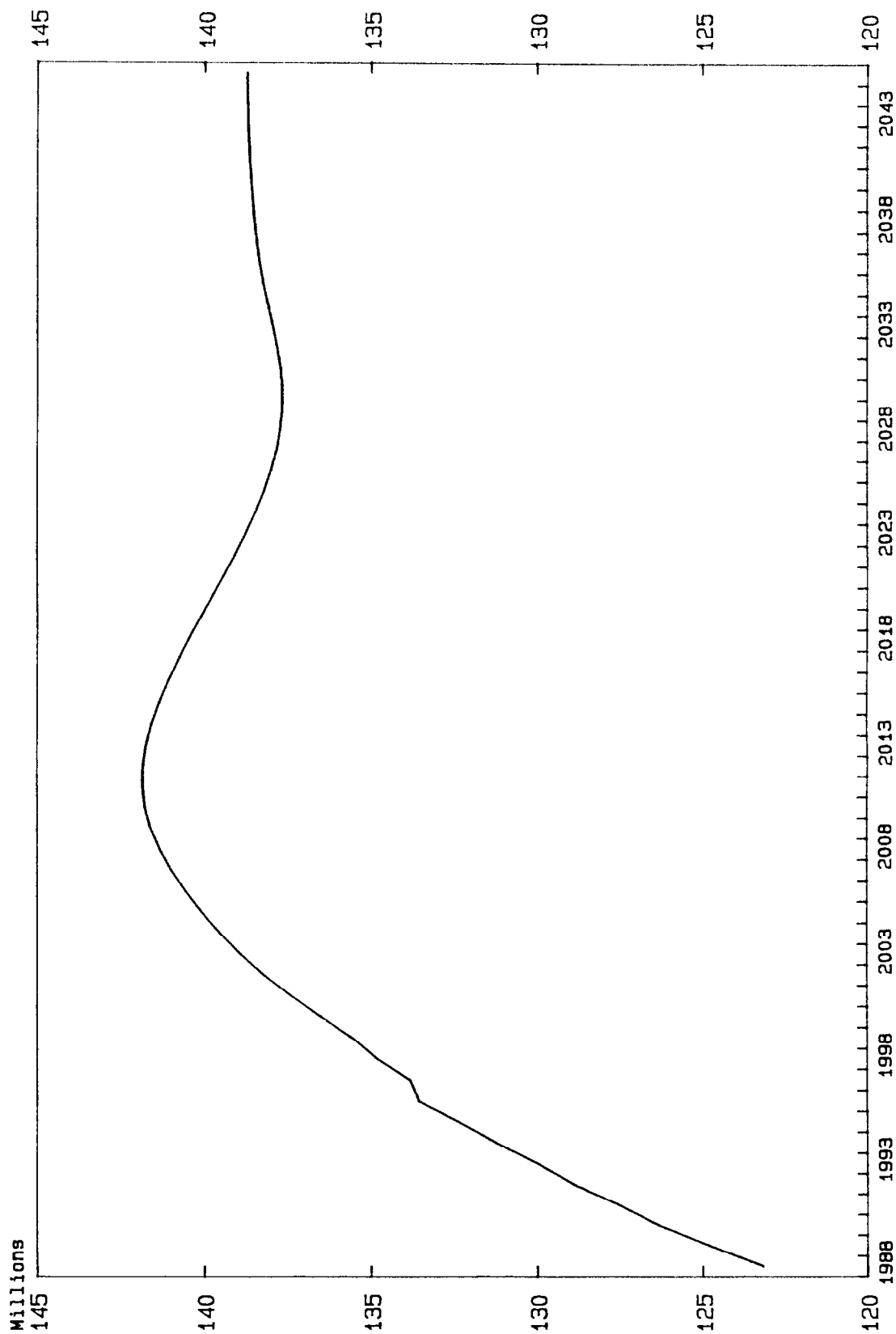
CHART 1
UNITED STATES
LABOR FORCE PARTICIPATION RATE¹



Source: Projections based on Social Security Administration data.

¹As a percent of total population aged 16 years and over.

CHART 2
UNITED STATES
TOTAL LABOR FORCE



Source: Projections based on Social Security Administration data.

partial insulation against whatever increase that occurs in the dependency ratio.

Against this background, the key policy issue that emerges is how to ensure that the growing social security surpluses are used to promote national saving and economic growth, thereby helping to attain a sufficient level of wealth to cushion the impact of the anticipated increase in the proportion of the elderly in the total population on future consumption needs and public expenditures. The principal conclusion is that it would be appropriate for the United States to run a surplus on a unified budget basis at least as large in size as the social security trust fund surpluses.

The paper is organized as follows. Section 2 focuses on recent and prospective developments in the social security system. Section 3 considers how the social security system might affect economic behavior and presents a number of scenarios evaluating the long-run impact of demographic changes and shifts in national saving. Section 4 briefly discusses the role of other government pension plans. Section 5 presents the principal policy conclusions and considers how they can best be implemented.

II. The U.S. Social Security System and its Financial Prospects

1. Background

Social security and medicare consist of four separate programs: old-age and survivors insurance (OASI), disability insurance (DI), hospital insurance (HI), and supplementary medical insurance (SMI). In this paper attention will be focused on the first two of these programs, commonly referred to as OASDI. ^{1/}

As can be seen from the tabulation, social security is now the largest expenditure program in the U.S. federal budget after defense.

^{1/} The HI and SMI programs are discussed in Ebrill (1989b).

Major Components of Federal Outlays 1/

(In billions of dollars)

| | Fiscal Year | | | |
|---------------------------|-------------|-------------|-------------|-------------|
| | <u>1989</u> | <u>1990</u> | <u>1992</u> | <u>1994</u> |
| Entitlements and other | | | | |
| mandatory programs | 523.3 | 528.0 | 599.4 | 659.6 |
| Of which: social security | 230.0 | 244.3 | 274.5 | 301.0 |
| Defense | 298.3 | 303.0 | 326.4 | 354.3 |
| Discretionary | 193.7 | 199.0 | 207.8 | 212.5 |
| Net interest | 165.7 | 170.2 | 154.4 | 132.1 |
| Undistributed offsetting | | | | |
| receipts | -36.9 | -36.6 | -40.2 | -43.9 |
| Other | -7.1 | -11.5 | -3.3 | -2.9 |
| Total | 1,137.0 | 1,152.1 | 1,244.5 | 1,311.7 |

As regards the history of the system, the social security act of 1935 established old-age insurance as a contributory pension system. 2/ In 1939, payments of benefits to spouses and dependent children of retired workers and extended benefits to dependents of deceased covered workers and retirees were made, creating OASI. In 1956, coverage was broadened to include benefits for some disabled workers (DI) where eligibility for these benefits was expanded in both 1958 and 1960. In 1965, Congress enacted Medicare, consisting of hospital insurance (HI, or Medicare part A) and supplementary medical insurance (SMI, or Medicare part B).

The financial status of the social security programs has passed through a number of phases. Prior to the mid-1950s, social security ran relatively large surpluses, though given the small absolute scale of the programs these surpluses had little macroeconomic significance. 3/ From 1955 to 1985, however, OASDI was essentially financed on a pay-as-you-go basis. This necessitated periodic changes in tax rates so as to ensure

1/ Source: Budget of the United States Government, FY 1990. The data for FY 1990 and beyond are budget projections.

2/ For more detailed background information, see Aaron, Bosworth, and Burtless (1989).

3/ Interestingly in light of the current debate, the social security financing schedule adopted at the outset envisaged the accumulation of reserves so that by 1980 interest earnings would cover about one third of the outlays. This policy, which would have implied significant funding of the program, was abandoned in 1939. See Thompson (1983).

the solvency and liquidity of the social security system. 1/ A notable example occurred in 1977 when Congress cut benefits and increased taxes in response to the fact that the formula for computing initial pension payments which had been in force in the mid-1970s had unintentionally provided excessive adjustments for inflation.

The congressional action in 1977 temporarily resolved the short-run liquidity problem then being experienced by the OASDI trust funds. It did not, however, resolve a longer-term imbalance that was in prospect. Demographic trends such as those tabulated in the introduction implied that the ratio of dependents to working-age population was going to increase with the result that, given existing tax and benefit schedules, the long-run viability of the OASDI trust funds was in doubt.

The liquidity problems that emerged again in the early 1980s 2/ provided an impetus to the reform efforts which culminated in legislation in 1983 that involved a combination of phased tax increases and benefit reductions. The decision underlying the legislation was in effect to depart from a pure pay-as-you-go system by partially funding the retirement benefits of the "baby boom" generation; given the legislative changes, the OASDI would run large and growing surpluses in the near term, to be followed by large and growing deficits in the next century as the current generation retires and the dependency ratio rises. 3/

1/ Solvency is not an absolute concept and the criteria for ensuring the solvency of the system have changed over time. The current practice in the case of OASDI is to calculate an actuarial balance over a 75-year time horizon where this balance is based on the present value of future income, outgo, and taxable payroll. In the case of HI, the projection period used to be 35 years on the grounds that the revenues and expenses of this program are more difficult to project than in the case of OASDI. However, the actuarial balance in this program has also recently been extended to 75 years, though the balance is calculated as the simple arithmetic average over that period of the difference between the annual cost and annual contribution rates as a percentage of taxable payroll. See 1988 Annual Report of the Board of Trustees of the Federal OASDI trust funds, pp. 29 et seq. and 1988 Annual Report of the Board of Trustees of the Federal HI Trust Fund, pp. 38 et seq.

2/ By the end of 1982, the net assets position of the OASI trust fund was negative, and money was borrowed from the DI and HI trust funds to meet the December 1982 benefit payments. See Thompson (1983), p. 1432.

3/ Emphasis should be placed on "in effect." At the time of the reform, the emergence of surpluses on the scale now projected was not envisaged. However, the expansion of the U.S. economy since 1983 greatly exceeded expectations and fueled a dramatic increase in the size of projected trust fund cash-flow surpluses.

Status of OASDI Trust Funds 1/

(Billions of dollars)

| <u>Calendar Year</u> | <u>Total Income</u> <u>2/</u> | <u>Total Outgo</u> | <u>Assets End of Year</u> | <u>Surplus</u> | <u>GNP</u> | <u>Surplus Percent of GNP</u> |
|--------------------------|-----------------------------------|------------------------|-----------------------------------|----------------|------------|---------------------------------------|
| 1990 | 309.5 | 252.2 | 211.9 | 57.3 | 5,382 | 1.1 |
| 1995 | 447.9 | 338.3 | 645.5 | 109.6 | 7,399 | 1.5 |
| 2000 | 631.5 | 446.8 | 1,409.4 | 184.7 | 10,048 | 1.8 |
| 2010 | 1,237.9 | 825.8 | 4,460.6 | 412.1 | 18,147 | 2.3 |
| 2020 | 2,226.2 | 1,775.4 | 9,124.3 | 450.8 | 31,473 | 1.4 |
| 2030 | 3,590.7 | 3,524.5 | 11,837.5 | 66.2 | 54,048 | 0.1 |
| 2040 | 5,470.6 | 6,121.7 | 8,840.4 | -651.1 | 93,621 | -0.7 |
| 2045 <u>3/</u> | 6,674.3 | 7,966.8 | 3,799.4 | -1,292.5 | 122,907 | -1.1 |

Specifically, as can be seen from the tabulation, the scenario generally viewed as most realistic suggests that there will be a steady accumulation of surpluses over the near term. Annual surpluses in nominal terms will peak at nearly \$500 billion; for example, the nominal surplus in 2015 is projected to be \$483 billion. Subsequently, however, the demographic trends which are expected to fuel these surpluses in the near term are also expected to result in their rapid diminution, with cash flow deficits beginning around the year 2030. In fact, were it not for the interest yield on existing assets, under this scenario the trust funds would begin to experience cash flow deficits about 2017.

When expressed as a percent of projected GNP, the surpluses peak at around 2 1/2 percent early in the next century. This is a large magnitude given the low rates of national saving currently observed in the United States. Moreover, by 2025 the stock of financial assets would

1/ Under Alternative II-B (Intermediate Pessimistic). This scenario is the alternative most commonly used in the public debate concerning the social security system. Further, Aaron, Bosworth, and Burtless (1989, page 41) conclude that on balance the assumptions underlying the scenario (Alternative II-B) are the most plausible; they note that while some of the assumptions appear overly optimistic--labor productivity is assumed to grow at 1.7 percent annually after 2010--others may be overly pessimistic--real interest rates are projected to be 2 percent after 1998. Any evaluation of the plausibility of this scenario should, however, recognize that the projections are very sensitive to the behavior of underlying variables which are themselves uncertain.

2/ Including interest on existing stock of assets.

3/ The combined OASDI trust funds are estimated to be exhausted in 2048 under Alternative II-B. See 1988 Annual Report of Trustees of the Federal OASDI Trust Funds.

amount to about 27 percent of GNP. This is a significant magnitude--for example the federal debt to GNP ratio in 1989 was about 43 percent.

A further feature to note is that, while the actuaries concluded in 1988 that the OASDI program as a whole is in close actuarial balance over a 75-year horizon, over time the program will tend to move into deficit by that criterion if tax and benefit schedules are left unchanged. Specifically, for the foreseeable future, the passage of each year will involve dropping a surplus year from the 75-year calculation while adding a year with a large prospective deficit. 1/ As a result, from a very long-run perspective, the social security system is not actuarially sound. 2/ The likelihood of some policy response to this emerging situation implies that the particular path of cashflow deficits now being projected may not in fact materialize.

The public debate has focused on how the growing social security surpluses should be handled. This debate has often revolved around the accounting issue of whether the cashflow surpluses should be excluded from the calculated federal budget deficit. While the primary focus of this paper is on the economic rather than on the accounting aspects of the issue, it is important to consider how the trust funds are treated within the federal budget before addressing the analytical dimensions of the problem.

2. Current accounting practices in the federal budget

The accounting treatment of the social security programs has varied over time. 3/ Prior to 1969, the operations of the trust funds were not included in the budget definition that was then the focus of fiscal policy. After 1969, OASDI and HI were included in the "unified" budget that was then the basis of federal budget policy. Subsequent to the recommendations of the 1982 National Commission on Social Security Reform, Congress mandated in 1983 that OASDI and HI, but not SMI, be removed from the unified budget, the move to take effect in 1993. The original GRH Act of 1985 designated OASDI, but not HI, as technically off-budget but required OASDI operations to be included in the GRH deficit-reduction targets, effectively keeping them in the unified federal budget. It is this accounting feature which has received much attention in the public debate concerning social security and the federal deficit.

1/ This feature is emphasized by Aaron, Bosworth, and Burtless (1989).

2/ While the hospital insurance (HI) trust fund is currently generating significant cashflow surpluses, its financial future is more precarious than that of the OASDI trust funds. Under Alternative II-B, the HI trust fund is projected to be exhausted by 2005 and the average annual deficit over the next 75 years is projected to be 2.37 percent of taxable payroll. See 1988 HI Annual Report.

3/ Aaron, Bosworth, and Burtless (1989).

III. The Impact of Social Security

1. Models of social security

In order to evaluate the macroeconomic implications of the social security surpluses, it is necessary first to determine how the social security system itself influences individual economic behavior. In part because the relationship that exists between an individual's contributions paid into and benefits received from the social security system is complex, depending inter alia on such factors as when that individual entered the system and the individual's relative income level and marital status, 1/ there have been a number of approaches to modeling the economic impact of social security on households.

One approach, which emphasizes that there is a tenuous link between individual payments and receipts, views social security as just another tax-transfer scheme. This approach focuses on OASDI revenues and expenditures at a particular point in time, ignoring the fact that people pay taxes while working and receive payments at a later stage upon retirement. 2/ By separating taxes from expenditures, the emphasis inter alia is on the regressive nature of social security taxes which are levied at a flat rate without exemption up to a ceiling. 3/

An alternative approach, which has generally come to dominate the recent debate, highlights the potential impact of social security in the context of the (pure) life-cycle model. There are two separate strands to the approach.

The first views the benefits paid out by the social security system as an ex post result of an ex ante insurance arrangement. 4/ From that perspective, social security can be viewed as a pooling of the risk of earnings losses due to retirement, disability, or death. The issues raised by this perspective are properly examined within a life-cycle framework and include a concern with the moral hazard problems typically associated with the provision of insurance. Note that the insurance view of social security considers taxes and benefits together but does not expect the benefits received by any one individual to bear any particular relationship to the taxes that individual paid during his/her working life. Further, and of significance for the policy discussion below, to the extent that the social security system provides insurance which would otherwise not be provided by the private sector it will tend

1/ See Boskin, Kotliff, Puffert, and Shoven (1981).

2/ This view was expressed in Pechman, Aaron, and Taussig (1968). The taxonomy of social security models used in this section is elaborated upon further in Thompson (1983).

3/ In this connection, it is interesting to note that more than half of U.S. taxpayers pay more in social security taxes than in federal income taxes. See Weaver (1989).

4/ See, for example, Viscusi (1979), and Diamond and Mirrlees (1978).

to remove an incentive for private saving, with possible implications for national saving.

Related to the insurance view has been the argument that social security is to some degree a forced savings program. It is argued that, for whatever reason, many individuals, if left to their own devices, would make inadequate financial provision for their retirement. Diamond, for example, concluded that some 20 percent of the population had savings patterns which did not appear to be sensible in light of likely retirement needs. 1/ One respect in which the forced savings perspective may differ from the insurance perspective is that a forced savings scheme will tend not to displace private savings.

The second strand--a strand which has received more attention lately--applies the same life-cycle perspective to social security as is often applied to private pensions. 2/ The social security taxes individuals pay are viewed in this approach as "pension" contributions which will yield retirement benefits in the form of social security payments at some later point. 3/ The absence of a close link in many cases between taxes paid and benefits received can here be rationalized as being due to social security also performing a secondary role, that of supporting the Government's income redistribution policies.

In this framework, individuals would be expected to take account of anticipated future social security benefits when making life-cycle savings decisions. Given the absence of Ricardian Equivalence, this implies that individuals would reduce other forms of private savings in light of those expected benefits. 4/ 5/ The empirical attempts to estimate the importance of this effect have produced mixed results. However, the low discriminating power of the tests used--whether time series or cross section--casts doubts on the usefulness of the existing

1/ See Diamond (1977). Also Kotlikoff, Spivak, and Summers (1982).

2/ This strand is of course related to the earlier strand since pensions can also be viewed as insurance schemes.

3/ Among the numerous contributions to this perspective are Feldstein (1974), Boskin (1977), Aaron (1982), and Bernheim (1987).

4/ In other words, the relevant version of the life-cycle model assumes that there is no bequest motive. This rules out the possibility that the intergenerational altruism which underlies the Ricardian Equivalence proposition would lead to the current generation being so concerned about the welfare of future generations as to reverse through bequest behavior any governmental action that might have the effect of redistributing resources across generations. See Ebrill and Evans (1988) for further discussion of the Ricardian Equivalence Proposition. Also, Barro (1974).

5/ The fact that social security income takes the form of an annuity in a world where the market for annuities is incomplete might have the additional impact of curbing the need for precautionary saving against the eventuality of living longer than expected.

empirical work in resolving how individuals have altered their savings behavior in light of the existence of social security. 1/

The next subsection considers the implications of these alternative models of the impact of social security for the appropriate treatment of the prospective demographically induced social security surpluses.

2. Potential implications of social security surpluses for economic policy

How best to treat the prospective social security surpluses hinges on two conceptually distinct though interdependent issues. The first issue concerns the fiscal question of how much each generation pays into and receives out of the social security system. This raises questions both of intergenerational equity and efficiency. The latter arises to the extent that policy makers are trying to decide between alternative tax rate/benefit paths. 2/ The second issue concerns the potential impact the treatment of the prospective social security surpluses might have on the path of national savings and hence on the path of national wealth accumulation. Given the demographic trends described above, this second issue is crucial since the course of national savings over the next few decades will help determine the capacity of the economy to insulate future living standards against the prospective increase in dependency ratios.

Concerning the first issue, irrespective of the underlying model of social security, a case can be made for "saving" the social security surpluses. 3/ Specifically, the 1983 reform of the social security system can be interpreted as being consistent with a decision to increase the amount of tax revenue the current working generation would pay toward its future social security benefits. In other words, the 1983 reform can be seen to constitute a resolution of the fiscal question of who pays how much and who gets how much from the social security system over the next few decades. 4/ What is crucial in this connection is that if the accumulating surpluses are used to finance current government expenditures, then the effect may well be de facto to undo the 1983 resolution of the fiscal question by placing an increased burden on the next generation--as the increased social security payments come due,

1/ The extensive empirical literature is reviewed in Annex I.

2/ The issue here concerns the realtive efficiency implications of smooth versus variable tax rate paths and is discussed further in Ebrill (1989).

3/ What this implies in operational terms is discussed later.

4/ In the absence of the reform, there is a presumption that the taxes paid by the next generation would have to be increased to finance the current generation's retirement consumption. This of course is not a foregone conclusion, because social security benefits could then be pared; taxes (e.g., consumption taxes) could be pitched toward the elderly; and/or there could be resort to increased borrowing.

other government expenditures may have to be reduced or tax revenues may have to be increased. 1/

Note that depending on one's perspective of the social security system, intragenerational as well as intergenerational equity considerations may be at stake. When social security is viewed as a tax-transfer scheme, spending the social security surpluses is tantamount to using a regressive payroll tax to finance government expenditures.

The concerns raised by the second issue are most readily addressed within the context of the model which views social security as being analogous to a private pension system. The analysis is facilitated by maintaining a distinction between two features of social security. On the one hand, from a very long-run steady-state perspective, the present social security system is essentially unfunded. On the other, as emphasized in this paper, the trust funds stand to experience large demographically induced swings in their cashflow positions over the next several decades.

The U.S. social security system, because it works on a pay-as-you-go basis from a long-run steady state perspective, may serve to depress wealth accumulation for a couple of reasons. The arguments are well known. 2/ First, if the sum of population and productivity growth rates is less than the real interest rate an unfunded social security system will tend to lower steady-state levels of lifetime resources. This is because in the steady state the benefit levels of a retired generation will, in the case of a pay-as-you-go system with constant tax rates, be determined by population and real wage growth, whereas the benefit levels will be determined by real interest rates in the case of a funded system.

Second, in the transition period following the introduction of an unfunded social security system, there may be crowding-out effects. The working generation at that time may tend to view its contributions as savings, but these contributions go to finance the retired generation's consumption, and not aggregate investment. Therefore, the increase in consumption of the initial generation to benefit from social security crowds out capital formation. As capital formation is crowded out, the wage rate will tend to fall and interest rates will tend to rise. 3/

These effects are intrinsic to the way the system is structured and are not likely to be altered radically in the foreseeable future. In contrast, the treatment of the social security trust fund cashflow

1/ Note that even if the surpluses are used to finance investments there could still be a potential fiscal problem due to the efficiency implications of having to use higher tax rates.

2/ For further elaboration, see Auerbach and Kotlikoff (1987).

3/ To the extent that the economy is open, this effect will be ameliorated.

surpluses is of topical policy interest since that treatment may have implications for the course of national saving and wealth accumulation over the next few decades.

Wealth accumulation determines the ability of society to sustain living standards and therefore underlies the fiscal question of the distribution of the burden of paying for social security. The prospective aging of the U.S. population implies that in the future available output per worker will have to be spread more thinly. 1/ This is a real economic shock which will take place irrespective of whether there is an intergenerational transfer associated with the use of the social security surpluses. The obvious way to mitigate the potential impact of this demographic shift would be to increase the rate of wealth/capital accumulation. 2/ That would require an increase in national savings.

That said, the mere fact of a demographic shock does not of itself call for government intervention to boost national savings--individual savings behavior motivated by lifecycle considerations should result in an increase in national savings as the baby-boom generation approaches retirement. However, to the extent that, as already argued, the baby-boom generation adjusts its other savings in light of anticipated social security benefits, a role emerges for government policy. 3/

The crucial point is that, if the social security cashflow surpluses are a useful proxy for the impact of the prospective demographic shock on social security, 4/ and if these surpluses are consumed rather than saved, then there will be no commensurate act of investment to underwrite what individuals view as their savings. Using the surpluses to finance other government current expenditures would be tantamount to their being consumed. 5/ The analysis thereby provides a ready rationale, ceteris paribus, for boosting national savings by increasing

1/ The aging of the population is in this connection demographically more significant than the fact that as the population ages there will tend to be relatively fewer children.

2/ An alternative approach, of course, would be to effect an increase in the labor supply. That raises the question of immigration policy.

3/ The presumption is that the economy's wealth accumulation is proceeding at a pace below that corresponding to the golden rule, a plausible presumption in the context of the U.S. economy.

4/ It is certainly an imperfect proxy. The fact that the social security system is not actuarially balanced if the time horizon is extended beyond 75 years indicates that the 1983 reform was insufficient to ensure that the system is balanced from a pay-as-you-go perspective over the very long run. Moreover, taking a broader perspective on the intergenerational implications of baby boom demographics, there is also the prospect of large HI deficits. See Ebrill (1990).

5/ In this respect, the impact on national savings of the social security surpluses associated with the demographic shock mirror the transitional effects discussed earlier which were associated with the introduction of the social security system.

federal savings by (at least) as much as the cashflow surpluses. Saving the surpluses will ensure that what individuals perceive to be an increment to their savings will be matched by an actual increase in national savings.

Although the quantitative link between the social security surpluses and the appropriate change in federal savings may be less obvious when some of the alternative models of social security are employed, a strong case can still be made for saving the surpluses. As noted above, the social security system, when viewed as an insurance scheme, will tend to remove a motivation for saving where this reduced motivation could well interact with demographic factors, with adverse consequences for national saving. Again, this effect could be countered by saving the social security surpluses. The same case can be made if social security is viewed as a forced savings scheme. If individuals, for whatever reason, are felt not to take proper account of their retirement needs, an obvious role exists for government intervention. In particular, the Government should take into account the implications of prospective demographic developments by boosting national savings.

The analysis to this point has emphasized the potential importance of the interaction of the social security system with demographic shifts. This raises the question of the magnitude of the impact of these demographic changes on output growth and on the contribution "saving" the social security surpluses can make toward mitigating that impact, a question which is addressed in the next section.

3. Demographic and national savings scenarios

The focus of the simulations presented in this section is on the potential role of increases in national savings as an insulator against the economic effects of prospective demographic shocks. These simulations are based on a closed economy, full employment model utilizing a growth accounting framework and associated data bank that was developed at the Brookings Institution. ^{1/} The structure of the model is briefly summarized in Annex II below. The salient feature of the model is that its baseline is consistent with the projections assumed to underlie scenario II-B of the actuaries of the social security system mentioned

^{1/} Aaron, Bosworth, and Burtless (1989).

above. ^{1/} Though a multisector framework, the model is driven by the nonfarm business sector. Output in that sector is determined by a Cobb-Douglas production function.

Though simple, the framework can illustrate the potential magnitude of shocks over the longer term. The first step is to gauge the potential impact of the prospective demographic shocks on relevant economic variables. As Chart 1 indicates, the labor force participation rate may decline by 10 percentage points beginning in the year 2000, according to the Social Security Administration's projections. ^{2/} The first scenario illustrates the effect of this change by considering the impact of a 1 percentage point increase above baseline in the labor force participation rate in every year between 2000 and 2045.

The results of this exercise are presented in Table 1. They indicate that such an increase--which translates into about a 2 percent increase in the labor force relative to baseline--has a significant impact on output and consumption. The output effect on the nonfarm business sector, where the direct impact of the shock is felt, is even larger. The increase in output induces an increase in capital stock where this increase in turn mitigates the initial decline in the

^{1/} Using the demographic and interest rate assumptions of the social security administration together with supplementary assumptions on other exogenous variables such as the private savings rate meant that total factor productivity had to behave residually to project a path of the economy which would generate social security trust fund flows of the same magnitude as those projected by the social security actuaries. The net effect is a growth rate in total factor productivity which increases from 0.9 percent a year in the late 1990s to 1.24 percent per annum in the late 2020s, a large increase. However, the scenario results presented in this appendix are in terms of deviations from the baseline, permitting one to abstract from many of the issues associated with interpreting the absolute levels of variables. The Aaron, Bosworth, and Burtless baseline incorporates judgmental changes to the social security system that would ensure the actuarial soundness of the system over the whole projection period.

^{2/} Note that the labor force participation rate only captures the effect of the baby boom generation's aging on demographics. Since the proportion of the population aged 16 and less might be expected, *ceteris paribus*, to decrease as the population ages, the behavior of this rate will tend to exaggerate the impact of prospective demographic changes on per capita consumption levels. The effect will nonetheless be large since the dependency ratio under Scenario II-b is projected to rise from about 70 percent in 1990 to about 83 percent in 2065 (OASDI, 1988, *op. cit.*).

wage-rental ratio. 1/ These results suggest that, in the absence of action, the labor force participation changes, which may well turn out to be ten times as large as those just simulated, are likely to have a significant depressing effect on the rate of growth of national output.

As has been argued above, an obvious way to insulate against the demographic shock is to increase the rate of national saving by "saving" the growing social security trust fund cashflow surpluses. Table 2 presents the results of such a scenario. The non-OASDI federal government balance is set equal to zero for the years 1993 through 2031--years in which OASDI is projected to be in surplus; in those years, the federal fiscal balance on a unified budget basis would be in surplus equal to the OASDI trust fund surpluses. For the subsequent years, the scenario set the non-OASDI balance equal to surpluses of whatever levels are needed to offset projected OASDI deficits and keep the federal budget in balance as in the baseline. 2/

The results indicate that this policy results in an appreciable increase in output. Consumption is initially depressed relative to baseline but subsequently increases significantly, reflecting the fact that this experiment, by increasing national saving, reduces consumption in the short term, permitting increased investment to sustain higher consumption in the long run. The capital stock increases significantly relative to baseline and, reflecting this, the wage-rental ratio increases significantly. The deviations from baseline become less pronounced in the final years of the projection period as federal fiscal policy, and therefore national savings, reverts to its baseline values.

A comparison of Tables 1 and 2 demonstrates that, within the context of the framework employed here, saving the OASDI surpluses could have an important though limited role in insulating the economy against the impact of an aging baby-boom generation. However, social security is not the only source of retirement income, and to the extent that life-cycle considerations influence behavior, private savings would also

1/ The behavior of real interest rates operates with a lag since it is based on a ten-year moving average of returns on tangible assets. It is important to remember that all changes are expressed in terms of a percentage deviation from baseline values.

2/ The baseline assumes the GRH path in the years up to and including 1993 and zero unified budget balance thereafter, implying that the surpluses are used to finance current government consumption. The alternative of setting the non-OASDI balance equal to zero for the whole period was not adopted since, as already pointed out, the 1983 reforms were insufficient to ensure the very long-run viability of OASDI--this alternative would, therefore, imply exceptionally rapid dissaving in the final years of the simulation.

be expected to increase. 1/ More generally, the results presented above may be sensitive to changes in the assumptions underlying the framework employed, and this raises a number of issues.

First, in line with the earlier analysis, it has been assumed that Ricardian equivalence does not hold. While the polar case of pure Ricardian equivalence seems implausible in light of the evidence, some intermediate position of a partial reversal by the private sector of the federal government's efforts to increase national saving might be relevant. 2/ Table 3 reports the results of an experiment in which the federal government again is assumed to save the OASDI surpluses but in which the private sector partially reverses this by reducing private savings by one third of the increase in federal saving. As expected, this partial reverse mutes the impact of the increase in federal savings.

Second, the basic model used in this paper assumes that technical progress is exogenous. An alternative view would be that technical progress is embodied in capital formation. To accommodate this view, the growth in total factor productivity was made endogenous by relating it to the level of gross investment (see Annex II). The impact of saving the OASDI surpluses was then reconsidered with the results being presented in Table 4. This change has an appreciable effect with output and consumption levels being significantly higher both than baseline values and in comparison to the results in scenario 2 (Table 2). Wage rates increase more than in scenario 2 while enhanced productivity--which could be interpreted as tantamount to an increase in the labor force measured in efficiency units--mitigates the decline in real interest rates. On balance, these results suggest that a broad range of effects could be associated with saving the OASDI surpluses, though in all cases presented, the conclusion is that such a policy could have a positive role to play in alleviating the impact of anticipated demographic changes.

Third, it is assumed that net foreign investment flows are zero. Relaxing this assumption would allow for the case where the United States invests some of its additional savings abroad, mitigating the general equilibrium tendency for those additional savings to drive down real interest rates (or the marginal product of capital) significantly

1/ It should also be remembered that the prospective social security surpluses are only a proxy for the amount of prefunding of the social security system which would be desirable in light of prospective demographic shifts. As already noted, OASDI is not actuarially sound over the longer term suggesting that further changes will be needed and implying that the demographically induced surge in expected social security benefits is considerably larger than the cash-flow surpluses.

2/ See Bernheim (1987).

(Table 2). 1/ However, when it is recognized that most industrial countries face the same demographic prospects as the United States, and might therefore also be increasing their respective national savings rates, the assumption of zero net foreign investment flows may be a useful working assumption from which to begin. 2/ In particular, these general equilibrium interest rate effects show that completely insulating the industrial countries as a group against demographic shocks may be difficult.

Fourth, obviously, the results depend on the demographic projections underlying the framework. While in many respects projecting demographic variables might seem relatively easy, even in this area of forecasting there are numerous imponderables. The projections depend, for example, on being able accurately to forecast fertility rates and average retirement ages, variables which may be endogenous in the long run. Further, the future path of dependency ratio is also likely to be sensitive to changes in immigration flows.

IV. Public Pension Plans

There is a wide range of public pension plans which share some of the features of the social security system and whose implications for the path of wealth accumulation should therefore be considered, if only briefly.

At the federal level, the two programs that warrant attention are the Civil Service Retirement System (CSRS) and the Military Retirement System (MRS). Both systems share with social security the fact that they have also essentially operated on a pay as you go basis and therefore have large unfunded liabilities. 3/ However, there also are important differences, which significantly complicate the analysis, between these two plans and the social security system. In particular, as part of the social security reform of 1983, all federal employees hired on or after January 1, 1984 were required to be covered by social security rather than the CSRS.

1/ Such a policy would also reduce the degree to which increased savings drive up the wages earned by labor in the next generation as a result of domestic capital deepening. While this might not change the share of total labor income it could have adverse welfare implications for labor in the next generation, ceteris paribus.

2/ On demographic trends in G-7 countries see Heller (1989) and Heller, Hemming, and Kohnert (1986).

3/ For example, the CSRS and the MRS were estimated to have net unfunded liabilities of \$575 billion and \$525 billion as of September 1982. See Leonard (1988).

Subsequently, the Federal Employee Retiree System (FERS) was established for these new employees. 1/ FERS is in part a defined benefits and in part a defined contributions plan, with a matching formula governing the federal government contributions to the latter part. 2/ The plan is therefore partially funded. This implies that the problem of unfunded liabilities associated with the CSRS plan will gradually be resolved as the earlier generation of federal employees retires and passes on, leaving a reduced problem with the unfunded portion of FERS since most of the unfunded liabilities will be under the social security umbrella. This prospect contrasts somewhat with the prospect of demographically induced increases in the unfunded liabilities of the social security system itself.

Similarly, although the stock of unfunded liabilities associated with the MRS remains high, over time that stock should be reduced following a decision by Congress in 1984 to put the system on an "accrual" basis. 3/ In theory, therefore, both programs are moving away from being pure pay-as-you-go systems.

At the same time, both programs are currently running cashflow surpluses, 4/ raising the question how these surpluses should be viewed? It was argued in the case of social security that the surpluses might constitute a reasonable proxy for the increment to wealth accumulation that would be appropriate in light of interactions between social security and prospective demographic developments. For the case at hand, however, it is not at all clear whether, and if so to what degree, the civil service and military retirement surpluses should be viewed as proxies in this manner. However, to the extent that these surpluses are used to defray current government expenditures within a unified budget framework, there would be no increase in national savings. Failure of

1/ Federal workers hired prior to January 1984 are eligible to opt for FERS but few have in fact done so.

2/ Broadly, the defined benefits component tops up the employees contributions so that the total of their social security contributions and the topping up under FERS equals employee contributions under CSRS. Concerning the thrift (defined contributions) component, the Federal Government automatically contributes 1 percent of annual salary into a thrift account and up to a further 4 percent in matching contributions. See Kerns (1986).

3/ Upon enactment of legislation in 1986, individuals entering the military after August 1, 1986 and retiring before the age of 62 with less than 30 years service can expect a reduction in their initial retirement annuity. This can be expected to have a significant cash flow impact on the MRS sometime in the next century as the system moves from one class of retirees to the other.

4/ The surpluses are significant. For example, in 1990 the surpluses for military and civilian retirement have been estimated to be \$16 billion and \$20 billion, respectively. Congressional Budget Office, 1988 Annual Report, February.

the federal authorities to ensure that the surpluses of these funds be used for increased private investment would appear to defeat the intent of the changes in these programs. In this context, the decision to move the contributory component of FERS completely off-budget was appropriate.

The state and local pension plans are also important. ^{1/} One estimate, possibly optimistic, found the collective unfunded pension liabilities for state administered plans to be \$170 billion in 1978. ^{2/} Again, the cashflow operations of the trust funds of these plans is difficult to interpret from the perspective of how best to accommodate aggregate demographic trends. However, it is worth noting that in recent years the state and local public sector has been running surpluses of about 1 percent of GNP where these surpluses are mainly due to the cashflow surpluses of their pension plans.

V. Concluding Observations

The United States will soon enter a period of significant demographic change. This paper has considered the implications of this change for the social security system and, specifically, has argued that it would be advisable to save the prospective cashflow surpluses of the system so as to help insulate living standards against demographic change. This policy may have acquired particular urgency in light of the low level of national savings in the United States.

There remains the question of how best to implement this policy recommendation. With the objective of reducing the path of government expenditures below what it would otherwise be, the possibilities most frequently mentioned are either to run a unified budget surplus to reflect the cashflow social security surpluses or to move the social security system completely off-budget--where presumably steps would be taken to ensure its solvency--balancing the remainder of the federal accounts. This choice raises the issue of how best to measure the federal fiscal deficit. Since the debate on this issue has been summarized elsewhere, ^{3/} the discussion here will be brief.

Which deficit measure to use depends in part on whether the focus is the short-run or the long-run effect of fiscal policy. If the former, then there is some presumption that a broadly based cashflow

^{1/} By the early 1980s, these involved some 5,000 separate plans covering 12 million employees and holding assets of over \$200 billion. See Leonard (1988), page 33.

^{2/} The result is due to Arnold and is reported in Kotlikoff and Smith (1983), pp. 393-405. However, Inman reported that the unfunded liabilities for state and local teachers' pensions alone amounted to about \$400 billion in 1980. See Inman (1985).

^{3/} For example, see Appendix XI, SM/88/162, Supplement 2.

deficit measure, which would gauge the aggregate demand effects of fiscal policy, would be appropriate. The current unified budget framework affords such a measure.

If, however, one is concerned with the longer-term effects of fiscal policy, then the importance of short-run liquidity effects is presumably mitigated, with fiscal policy having its primary impact through its effect on lifetime budget constraints appropriately defined. The precise impact of fiscal policy will then depend on the underlying model of economic behavior. In this paper, the (no bequest) life-cycle model has been assumed to be the appropriate benchmark. Others have argued in favor of Ricardian Equivalence, effectively rendering the concept of the deficit meaningless. At a minimum, this longer-run perspective implies that cashflow deficit measures could be seriously flawed. For example, given the life-cycle perspective, the cashflow social security surpluses could in reality be masking an underlying social security deficit if the corresponding contingent liabilities were properly taken into account.

These accounting difficulties have led some to argue that the definition of "deficits" is fundamentally arbitrary. ^{1/} Others would argue that, though flawed, the cashflow deficit measure can be corrected. ^{2/} In the present context, taking this latter more pragmatic approach might well lead to the conclusion that the unified budget measure be retained but that surpluses be run on that measure. ^{3/} This would ensure that any further legislative changes in the social security system, which could have aggregate demand effects, are captured by the deficit measure, while running surpluses would counteract the longer-term impact of demographically induced changes in social security on private savings and would prevent large tax increases in the future.

A final observation: the tentative conclusion above is based on economic considerations. There are, however, a range of issues associated with budgetary politics which could influence this decision. ^{4/} Resolution of these further issues would be beyond the scope of this paper.

^{1/} See, for example, Auerbach and Kotlikoff (1987) and Kotlikoff (1984).

^{2/} See, for example, Eisner and Pieper (1985) and Eisner (1988).

^{3/} The implicit assumption here is that maintaining approximate balance on the nonsocial security component of the budget would be appropriate. In reality, the appropriate nonsocial security fiscal deficit would depend on circumstances.

^{4/} This includes the fear that if the social security trust funds are not placed truly off-budget--perhaps under the jurisdiction of a separate authority--the temptation to use the surpluses in other ways may prove too great. See, for example, Leonard (1989).

Empirical Evaluation of the
Impact of Social Security Wealth

In one of the first major attempts to evaluate the impact of social security wealth on individual consumption behavior, Feldstein concluded that in 1971 the social security system had halved personal saving. However, the manner in which the social security wealth variable was calculated turned out to be flawed and when that variable was recalculated the effect was found to be insignificant. ^{1/} Feldstein's contribution, however, spawned a large literature in which a number of issues were raised.

One specific issue concerns how best to measure an individual's expected benefits from social security. The traditional approach has been to use the actuarial value of benefits. It has been argued, however, that given the (no bequest) life-cycle perspective the simple discounted value of future benefits (ignoring the possibility of death) would be a more appropriate measure to employ. ^{2/} A more general theoretical point concerning the linkage between social security and the underlying life-cycle hypothesis is that changes in the parameters of social security affect all the consumption function coefficients as well as the size of social security wealth. ^{3/}

These conceptual difficulties are compounded by problems of econometric identification. ^{4/} Specifically, social security wealth is typically defined as a deterministic function of other variables such as age, earnings, history, etc. Many of these variables should be included independently in the behavioral equation implying that social security wealth is a function of the other right hand side variables. As a result, in the absence of a detailed knowledge of the functional form of the equation, identification will be extremely difficult and results will be very sensitive to the specification selected.

^{1/} See Feldstein (1974) and Leimer and Lesnoy (1982).

^{2/} See Bernheim (1987). The essence of the argument is that a life-cycle consumer with positive savings is assumed to purchase a conventional asset for its survival-contingent claim. At the margin, one therefore uses the market price of future resources--effectively the price of survival-contingent resources--to value annuity claims. This amounts to simple discounting of benefit streams. Bernheim concludes that estimates based on actuarial valuation may understate the depressive effect of social security on private savings by a factor of three or more.

^{3/} In this connection, Williamson and Jones emphasize that in the transition period from no social security to a social security program with extensive coverage--a period from which much of the data for the empirical tests have been drawn--parameters were changing steadily implying that the reported estimates are subject to functional form errors. Williamson and Jones (1983).

^{4/} See Bernheim and Levin (1988).

An alternative strategy for quantifying individuals' expected social security benefits more directly is to rely on survey data. Bernheim and Levin, for example, use survey data drawn from the Retirement History Survey which tracked a sample of retirement-aged households for a period of ten years, beginning in 1969. ^{1/} However, the results using survey data also appear mixed, which may in part be due to the ambiguous quality of the data.

^{1/} Bernheim and Levin (1988).

Structure of Growth Model

The illustrative simulations presented in the text are based on a simple growth model with accompanying data bank that was developed at the Brookings Institution to consider the implications of prospective demographic developments on the social security system. ^{1/} The assumptions underlying the calculations are based on the mid-range economic assumptions used by the actuaries of the Social Security Administration. ^{2/}

The model consists of five sectors: nonfarm business, agriculture, government, nonprofit institutions, and private households. Most attention is devoted to articulating behavior in the nonfarm business sector, with capital accumulation in that sector being derived from assumptions concerning private saving and government saving. Specifically, the capital stock of the economy is defined as

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

where K refers to the capital stock, I to domestic investment and δ to the constant geometric rate of depreciation. On the assumption that net foreign investment is zero ^{3/}, domestic investment is financed by national savings where

$$S = S_p + S_{ss} + S_{gf}$$

where S_p refers to private savings, S_{ss} to the social security surplus/deficit, and S_{gf} to net saving in the federal government's general fund accounts. In the simple framework under consideration, it is further assumed that private saving in the baseline are governed by

$$S_p = 0.18 \text{ GNP}$$

^{1/} See Aaron, Bosworth, and Burtless (1989) for further elaboration of the underlying model. The specific version of the model and the data bank used in this appendix was supplied by the Congressional Budget Office (CBO). In this connection, the cooperation and assistance of Mr. F. Ribe and Mr. J. Sabelhaus, both of CBO, are gratefully acknowledged.

^{2/} Annual Report of Trustees, *op. cit.*

^{3/} The implications of making this assumption are discussed in the main body of the text.

where this value, which is held constant throughout the simulation period, is based on observed behavior in the postwar period.

The social security surplus S_{ss} in the baseline is based on the social security scenario II-B projections (intermediate pessimistic) for OASDI. The baseline for the non-OASDI federal government balance S_{gf} follows a path consistent with the GRH until 1993--in that year the sum of S_{gf} and S_{ss} balance to zero--and subsequently it is assumed to be the negative of the actuaries projections for the social security balances under II-B. This implies balance on a unified budget basis after 1993.

Labor and capital are allocated across sectors in light of observed trends or ratios over the postwar period. Output in the nonfarm business sector Y is generated by using a Cobb Douglas production function

$$Y_t = A(t) K_t^{0.33} L_t^{0.67}$$

where the exponents on K and L are based on the capital income share in the II-B projections. Compensation rates outside the nonfarm business sector are assumed to maintain their historical relationship to those within the nonfarm sector. Hence real wages in the economy are determined within the nonfarm business sector. $A(t)$, total factor productivity, is set so that the baseline projection matches the GNP forecast under the II-B projections.

The baseline assumes that there is no link between investment and the rate of technical advance. In some of the subsequent simulations such a link is assumed. Specifically, to capture the sense of embodied technical progress, the growth rate of total factor productivity was regressed on the level of real gross investment scaled by real GNP over the sample period 1952 to 1988. The estimated equation is:

$$d \log A_t = 0.0564 I_t / GNP_t \\ (2.889)$$

where the t -ratio is in parentheses.

Finally, the Brookings model has a fully articulated social security sector. This was not employed in the simulations in this appendix given the focus on trends in national savings rather than in the finances of the social security system per se. It should be noted that making the social security system endogenous would not necessarily change the comparative static results appreciably since changes in macroeconomic variables such as growth, for example, will tend to have a similar impact in present value terms on both social security revenues and social security taxes.

Table 1. Scenario 1: Increase in Labor Force
Participation Rate

(Percentage deviation from baseline)

| | GNP | Consump- tion <u>1/</u> | Capital Stock | Labor Force | Wage Rate <u>2/</u> | Real Interest Rate <u>3/</u> |
|------------------------|-----|----------------------------|------------------|----------------|------------------------|------------------------------------|
| 2001 | 1.1 | 1.2 | -0.1 | 2.0 | -0.7 | 0.3 |
| 2003 | 1.1 | 1.2 | 0.1 | 2.0 | -0.7 | 1.0 |
| 2005 | 1.2 | 1.3 | 0.2 | 2.1 | -0.6 | 1.7 |
| <u>Annual averages</u> | | | | | | |
| 2006-2015 | 1.3 | 1.4 | 0.4 | 2.1 | -0.6 | 3.1 |
| 2016-2025 | 1.6 | 1.7 | 0.8 | 2.3 | -0.5 | 3.3 |
| 2026-2035 | 1.8 | 1.9 | 1.2 | 2.4 | -0.4 | 3.1 |
| 2036-2045 | 1.9 | 2.0 | 1.5 | 2.4 | -0.3 | 2.6 |

Notes: 1/ Consumption is defined as GNP less gross investment. The presumption is that government expenditures are part of current consumption. The trade balance is not reported separately in this framework; however, since the results are presented in terms of deviations from baseline, failure to net this factor out is unlikely appreciably to affect the results.

2/ Nominal wage rate for both employees and self-employed workers in the nonfarm business sector. Inflation is held exogenous in the model.

3/ Defined as the real rate of return on financial assets which is derived by multiplying the ten years moving average of the return on tangible assets by a conversion ratio between the real return on tangible and financial assets. The rate of return on tangible assets is equal to the net return on reproducible capital less corporate taxes. The deviations from baseline are expressed as a percent of the baseline real interest rate.

Table 2. Scenario 2: Social Security Surpluses Saved 1/
(Percentage deviation from baseline)

| | GNP | Consump- tion | Capital Stock | Labor Force | Wage Rate | Real Interest Rate |
|------------------------|-----|------------------|------------------|----------------|--------------|--------------------------|
| 1994 | 0.3 | -1.6 | 2.5 | -- | 0.4 | -0.2 |
| 1995 | 0.6 | -1.4 | 3.5 | -- | 0.8 | -0.4 |
| <u>Annual averages</u> | | | | | | |
| 1996-2005 | 2.0 | -0.7 | 8.2 | -- | 2.4 | -5.2 |
| 2006-2015 | 3.8 | 0.6 | 14.3 | -- | 4.4 | -17.5 |
| 2016-2025 | 4.3 | 2.2 | 14.7 | -- | 4.7 | -26.0 |
| 2026-2035 | 3.0 | 2.7 | 9.5 | -- | 3.2 | -24.3 |
| 2036-2045 | 1.6 | 1.6 | 4.9 | -- | 1.7 | -14.5 |

Note: 1/ Definitions as in Table 1.

Table 3. Scenario 3: Social Security Surpluses Saved
With One-Third Ricardian Equivalence 1/

(Percentage deviation from baseline)

| | GNP | Consump- tion | Capital Stock | Labor Force | Wage Rate | Real Interest Rate |
|------------------------|------|------------------|------------------|----------------|--------------|--------------------------|
| 1994 | 0.23 | -1.1 | 1.6 | -- | 0.3 | -0.1 |
| 1995 | 0.43 | -1.0 | 2.4 | -- | 0.5 | -0.3 |
| <u>Annual averages</u> | | | | | | |
| 1996-2005 | 1.3 | -0.4 | 5.5 | -- | 1.6 | -3.5 |
| 2006-2015 | 2.6 | 0.4 | 9.5 | -- | 3.0 | -12.0 |
| 2016-2025 | 2.9 | 1.5 | 9.8 | -- | 3.2 | -17.9 |
| 2026-2035 | 2.0 | 1.8 | 6.3 | -- | 2.2 | -16.7 |
| 2036-2045 | 1.1 | 1.1 | 3.3 | -- | 1.2 | -9.8 |

Note: 1/ Definitions as in Table 1.

Table 4. Scenario 4: Social Security Surpluses Saved
With Embodied Technical Change 1/

(Percentage deviation from baseline)

| | GNP | Consump- tion | Capital Stock | Wage Rate | Real Interest Rate | Total Factor Produc- tivity |
|------------------------|-----|------------------|------------------|--------------|--------------------------|--------------------------------------|
| 1994 | 0.5 | -1.5 | 2.5 | 0.6 | -0.1 | 0.2 |
| 1995 | 0.9 | -1.2 | 3.5 | 1.1 | -0.4 | 0.3 |
| <u>Annual averages</u> | | | | | | |
| 1996-2005 | 2.8 | 0.1 | 8.4 | 3.3 | -4.4 | 0.9 |
| 2006-2015 | 6.1 | 2.8 | 15.4 | 7.0 | -14.5 | 2.3 |
| 2016-2025 | 8.2 | 6.0 | 17.3 | 9.1 | -20.8 | 3.5 |
| 2026-2035 | 7.9 | 7.4 | 13.4 | 8.5 | -18.7 | 4.0 |
| 2036-2045 | 6.9 | 6.7 | 10.0 | 7.5 | -10.7 | 4.1 |

Notes: 1/ Definitions as in Table 1.

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