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WP/89/99

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department and Western Hemisphere Department

**National and Personal Saving in the United States:
Measurement and Analysis of Recent Trends**

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December 13, 1989

Abstract

This paper analyzes several issues regarding the measurement of saving and concludes that the observed declines in national, private, and personal saving rates in the United States cannot be attributed to measurement problems. It then examines several factors that seem to have been behind the decline in U.S. personal saving. It suggests that structural changes in capital markets as well as improvements in wealth positions, in the living standards of the elderly, in social security pensions, and in private and public insurance mechanisms all contributed to the declining trend in personal saving. Empirical results suggest that demographic factors may also have played a major role.

JEL Classification Numbers:

023, 321

* The authors would like to thank Vito Tanzi, Liam Ebrill, Yusuke Horiguchi, George Kopits, and Leif Mutén for their helpful comments.

	<u>Contents</u>	<u>Page</u>
Summary		iii
I.	Introduction	1
II.	Recent Trends in Saving	1
III.	Alternative Saving Measures	3
	1. Measurement errors and personal saving	3
	2. Consumer durables and public investment	4
	3. Capital gains and losses	5
	4. Inflation	6
	5. Pensions	6
	6. Social security	7
	7. Summary	8
IV.	Models of Personal Saving Behavior	9
V.	Explanations for the Downward Trend in Personal Saving	11
	1. Wealth effects	11
	2. Social security pensions and improvements in living standards of the elderly	13
	3. Improved insurance	15
	4. Demographic trends	17
	5. More efficient and integrated capital markets	18
	6. The role of real after-tax interest rates	19
	7. The role of inflation	19
VI.	An Empirical Analysis of Personal Saving	20
	1. Estimation	20
	2. Simulation results	24
VII.	Conclusions	26
Tables		
	1. United States: Saving and Investment, 1950-88	28
	2. United States: Various Measures of Net National Saving Rates, Selected Years	29
	3. United States: Composition of National Saving	30
	4. Personal Saving Ratios and Stock Market Capital Gains, 1980-86	31
	5. Relative Income of the Elderly and Nonelderly, Selected Years, 1950-85	32
	6. Saving Rates and Simulation Results	33
References		34

Summary

This paper examines various issues relating to national and personal saving in the United States. After a discussion of how various components of national saving as measured by the National Income and Products Accounts (NIPA) have evolved since 1950, the paper explores several issues regarding the measurement of saving, such as including accrued capital gains, household purchases of nonresidential consumer durables, and government spending on capital goods in saving measures, as well as correcting saving measures for inflation and counting social security contributions as private saving. It concludes that the observed declines in national, private, and personal saving rates cannot be attributed to measurement problems.

The paper describes the main theoretical models derived to explain personal saving behavior and uses these models to examine the factors behind the recent decline in personal saving. Empirical studies generally suggest that improvements in wealth positions owing to the rising values of the stock market and housing have encouraged the declining trend in personal saving. More generous social security pensions, improved public and private insurance schemes, and expanded government programs supporting higher education and home ownership are also likely to have lowered national saving because they reduced the need for personal saving. At the same time, public saving failed to offset the decline in personal saving. Furthermore, changing age composition of the population may have reduced aggregate personal saving over the past two decades as the coming of age of the large baby-boom generation and the aging of the population have increased the population shares of groups characterized by relatively low saving rates. Several studies have attributed part of the decline in the personal saving rate to more efficient capital markets that increase the amount of credit available to households and facilitate corporate restructuring.

A simple empirical framework is presented to assess the contribution of various factors underlying the recent decline in the U.S. personal saving rate. According to the results, the shifting demographic structure of the U.S. population--in particular the increase in the proportion over age 65--has been particularly important in contributing to the decline in personal saving in the 1980s, with the rise in the wealth to income ratio and the decline in the rate of inflation also significant. An increase in the real after-tax of interest may have served to moderate the magnitude of the fall in the personal saving rate.

I. Introduction

This paper examines various issues relating to national and personal saving in the United States. Section II discusses how various components of national saving (as measured by the National Income and Products Accounts) have evolved since 1950. It shows that national saving relative to national product has declined over this period (on both a gross and a net basis) and that a secular downward trend in the private saving rate, and the personal saving rate in particular, accounts for a major part of the deteriorating national saving performance. Section III addresses several issues regarding the measurement of saving. It concludes that the observed declines in national, private, and personal saving rates cannot be attributed to measurement problems.

Section IV describes the main theoretical models that have been used to explain personal saving behavior. Section V uses these models to examine several factors that seem to have been behind the decline in personal saving. It suggests that improvements in wealth positions, in the living standards of the elderly, in social security pensions, and in private and public insurance mechanisms may all have contributed to the declining trend in personal saving. Demographic factors and structural changes in capital markets also appear to have played a role.

Section VI presents an empirical model of personal saving, in which demographic variables, the real after-tax interest rate and the rate of inflation are important. According to simulation experiments, the changing demographic structure of the U.S. population played a major role in contributing to a declining personal saving rate in the 1980s. The rising ratio of wealth to disposable income and the decline in inflation were also significant, while the increase in the real interest rate mitigated the decline. Section VII provides the conclusions.

II. Recent Trends in Saving

This section discusses recent trends in the most commonly used saving measures, which are derived from the National Income and Product Accounts (NIPA). Table 1 presents net saving relative to Net National Product (NNP) for the decade averages over 1950-79 and annually since 1980. Net national saving comprises net public and private saving with the latter, in turn, consisting of personal and corporate saving. The state and local government surplus and the federal government surplus add up to total public saving.

The NIPA net national saving rate fell substantially in the 1980s, from an average of about 8 1/4 percent of NNP during 1950-79 to 2 1/2 percent in the post-1981 period. Although rising dissaving by the public sector played an important role, falling private saving also contributed to the weakening national saving performance. The public and private sectors each accounted for about half of the decline in the NIPA

net saving rate from 1950-79 to 1982-88. The decline in the national savings rate was reflected in the widening imbalance between national investment and national saving, and in the increased reliance on foreign saving, which as a percentage of NNP reached a peak of almost 4 percent in 1987. Moreover, whereas private saving traditionally provided sufficient funds to finance private investment in the post-1950 period, the private saving/investment surplus fell after 1982 and turned negative in 1987.

A declining trend in the personal saving rate explained most of the fall in the private savings rate. The net personal saving rate as a percentage of NNP declined from its historical average of about 5 1/2 percent in the beginning of the 1980s to about 3 percent in 1987-88.

Gross private saving as a share of GNP is presented as a memorandum item in Table 1. In contrast to the share of net private saving in NNP, which started to fall in the mid-1970s, gross private saving as a proportion of GNP has remained relatively stable within a range of 15 1/2 to 18 percent during the 1950-85 period. Nevertheless, after reaching a postwar high by the end of the 1970s, this saving measure has also declined recently, especially since 1984, reaching 15 percent of GNP in 1987 and 1988--the lowest levels since the 1940s.

Diverging trends in gross and net measures of saving point to important changes in depreciation rates. In fact, the share of depreciation in GNP rose significantly at the end of the 1970s and the early-1980s. This rising trend was due in part to a slowdown in productivity growth which raised the capital output ratio. More importantly, it reflected a shift in the pattern of nonresidential investment away from longer-lived assets, such as structures, toward shorter-lived assets, especially information processing equipment. ^{1/} Although technological change may have contributed to changing the composition of investment toward shorter-lived assets, taxation played a significant role as well. Several studies suggest that tax rules, especially when the rate of inflation was high, have typically favored equipment over structures. ^{2/}

While net saving is the relevant concept for measuring the accumulation of wealth and the intertemporal allocation of consumption, gross saving is also an important measure. In particular, a higher rate of

^{1/} Corker, Evans, and Kenward (1988) discuss in more detail recent movements in the composition of corporate investment, including the increase in the investment share of assets with relatively low service lives. See also de Leeuw (1989).

^{2/} See, for example, Bosworth (1981), Gravelle (1983), and King and Fullerton (1984). Other studies have argued that additional uncertainty associated with higher and more variable inflation rates and anticipated larger fiscal deficits have raised long-term real interest rates relative to short-term real rates, thereby shifting the investment mix toward shorter-lived assets.

gross saving may lead to more rapid economic growth if technical change is embodied in new capital goods or if introducing new capital generates significant learning-by-doing effects. Moreover, gross saving measures tend to be more reliable than net saving measures; in contrast to measures for net saving, measures for gross saving do not rely on estimates for depreciation, which are subject to various statistical and conceptual problems. Nevertheless, the rest of this paper focuses on the net saving concept in view of its focus on the accumulation of wealth and intertemporal consumption decisions.

III. Alternative Saving Measures

This section deals with several issues regarding the measurement of national saving and its components. It presents some alternative measures to test whether the decline in saving as reported by the NIPA is confirmed if saving is measured in alternative ways. The first three subsections examine measurement issues that affect national saving as the aggregate measure of household, business, and public saving. The last three subsections address statistical issues that, while leaving aggregate national saving largely unaffected, primarily affect the allocation of national saving among the household, business, and public sectors.

1. Measurement errors and personal saving

When preparing the NIPA, the Department of Commerce measures personal saving as a residual from much larger figures. It estimates saving from the sources side of income by subtracting personal outlays from personal disposable income. Measurement errors in each of these components may be quite large relative to net saving. ^{1/} In particular, income earned in the underground economy tends to escape the NIPA income measure, ^{2/} suggesting that this saving measure may underestimate actual saving.

Another official measure of personal saving, which is conceptually equivalent to the NIPA measure, has generally yielded a somewhat higher estimate. This measure, which is prepared on the basis of flow of funds data gathered by the Federal Reserve, focuses on the uses to which wealth is put. It derives the estimate of saving by adding the increase in net financial assets held by households to net household residential investment. The Federal Reserve estimates net financial assets held by households as a residual from the financial assets position of other

^{1/} In recent years, the personal savings rate generally has been revised substantially after a preliminary annual figure is first published in January of the subsequent year. To illustrate, the average upward revision of personal saving in percent of disposable income amounted to 1.6 percentage points over the period 1976-80.

^{2/} Most consumption, in contrast, is measured accurately.

sectors. This procedure may lead to an upward bias in the flow of funds estimate of personal saving because increases in assets held in the United States by nonresidents are most likely underestimated due to the owners' desire for anonymity. Therefore, it may erroneously attribute the ownership of some asset accumulation by nonresidents to domestic residents. 1/

The nature of the measurement errors suggests that the actual personal saving rate lies between the values reported by the Department of Commerce and the Federal Reserve. Based on the analysis of quarterly fluctuations, de Leeuw (1984) argues that the NIPA measure is probably more reliable. Bosworth (1981, p. 65 and p. 181) arrives at the same conclusion in view of the severe difficulties in tracing the ownership of financial assets.

2. Consumer durables and public investment

Another problem with the traditional saving measure is that it excludes household purchases of nonresidential consumer durables and government spending on capital goods. Boskin, Robinson, and Huber (1989) provide more comprehensive measures of saving that include these items. At the same time, they account for the imputed rental flow of services from these assets as consumption and income. Table 2 contains some of their results. 2/ The first column reports net national saving on a NIPA basis. The second column adjusts these by counting all public nonmilitary capital formation as saving. These data reveal that not only private saving but also public investment has trended downwards in the past three decades.

A more comprehensive saving measure, which is reported in the third column, includes in saving both nonmilitary government capital and household durables. Data indicate that including nonresidential consumer durables in saving raises the saving rate somewhat. Nevertheless, even on this extended definition, net saving as a proportion of NNP fell

1/ Thus, the bias in the Federal Reserve measure for household saving is closely related to the discrepancy in the U.S. balance of payments.

2/ Their measures need to be interpreted with caution because the adjustments are subject to large measurement errors. To illustrate, the rental flow on durables and public capital is computed as the product of the capital stock and a real opportunity cost, which is difficult to measure. Moreover, separating public expenditures into consumption and investment is difficult.

by half between 1950 and 1985. ^{1/} Moreover, savings in the form of consumer durables (including residential investment) are rather different from savings in financial assets. In contrast to financial savings, savings in durable goods absorb real resources within the personal sector. Consequently, they are made available neither for reducing the imbalance between national investment and saving; ^{2/} nor for financing investment in plant and equipment in the corporate sector. The before-tax return on these latter investments is likely to exceed the return on consumer durables in view of differential tax treatment; whereas the return on financial assets (through which the household sector helps to finance investment in the corporate sector) is taxed at both the personal and corporate levels, the imputed return on consumer durables remains tax exempt.

3. Capital gains and losses

The NIPA saving measures exclude accrued real capital gains and losses although these gains and losses may represent changes in net wealth. As advocated by Shoven (1984), some studies have included capital gains in a single comprehensive measure of saving by using the Federal Reserve's balance sheets for the U.S. economy. Bradford (1989), for example, has argued that a measure of saving based on changes in wealth corresponds more closely to the relevant theoretical concepts. As with Shoven's earlier work, the resulting savings series were highly volatile from year to year and difficult to interpret. Nevertheless, the declining trend in aggregate saving relative to income reflected in the national accounts data is also evident in wealth-based measures (Table 1). Thus, although exact magnitudes may differ according to the employed concept, the broad picture of a declining national saving rate remains.

^{1/} Whereas including consumer durables does not greatly affect the time trend in saving, it may affect international comparisons of saving behavior. Lipsey and Kravis (1987) show that the United States invests more heavily in consumer durables than other industrial countries do. When comparing saving behavior in the United States to that in Japan, several studies including Boskin and Roberts (1986) and Hayashi (1986) confirm this finding. More generally, Lipsey and Kravis (1987) argue that the United States channels a relatively high share of its capital formation through the household sector. They maintain, for example, that high personal tax rates in other industrial countries provided an incentive to substitute cars provided by employers, which are counted as producer durables, for cars owned by households, which are consumer durables.

^{2/} If measured saving is raised by reclassifying consumer durables and public investment as domestic saving, domestic investment is also increased. Therefore, the saving-investment balance is unaffected.

Some have argued in favor of separately accounting for capital gains rather than including them in a comprehensive saving measure. In their view, the behavioral effects associated with income in the form of capital gains are rather different from those associated with other income. Summers and Carroll (1987a), for example, suggest that the marginal propensity to save out of stock market capital gains is close to unity and much larger than that out of other income. Furthermore, as Hendershott and Peek (1985a) show, the effects of capital gains on the well-being of the asset holder depends both on the intent of the asset owner and on the life of the asset. If the asset holder intends to hold the asset until the end of its useful life (as is the case for many consumer durables), capital gains may fail to improve his position. In fact, the owner may lose from capital gains if he intends to replace the asset because capital gains are likely to be associated with higher replacement costs.

4. Inflation

The NIPA fail to adjust saving measures for inflation by recording all nominal interest receipts as income. During inflationary periods, however, the inflation premium in interest rates amounts to a repayment of the principal that creditors must set aside to maintain the real value of their wealth. Therefore, only the real interest component of the nominal interest receipts should be counted as income.^{1/} On the one hand, the NIPA measures understate saving by the public and corporate sectors if inflation is positive because these sectors typically are net debtors. On the other hand, personal saving is overstated because households generally are net creditors.

5. Pensions

Corporate pensions raise another issue regarding the allocation of saving between the corporate and household sectors. The NIPA treat all contributions to pension plans and income earned by these plans as personal income. Most corporate pension plans, however, are defined benefit plans in which employers commit themselves to provide retired workers with a stream of income that does not bear a relationship to the corporate plan's asset position. Therefore, assets in defined benefit plans are effectively assets of the corporation because the funding of these plans affects neither the firm's liability nor the value of the employee's asset.

Table 3 adjusts the standard measures of saving for inflation and pensions. The inflation adjusted series for private saving, which is contained in the fourth row, shows a pronounced downward trend from the

^{1/} See, for example, Jump (1980).

mid-1960s to the end of the 1970s. ^{1/} The declining inflation rate in the 1980s, however, has been accompanied by a more stable series for adjusted private saving during this period. In particular, the inflation adjusted series for personal saving suggests that the reduction in inflation in the 1980s has been an important factor behind the fall in the NIPA personal saving rate during this period. Consequently, the inflation adjusted series attributes more of the decline in national saving over the 1980s to public saving than the NIPA series does.

The pension and inflation corrections raise the corporate share in private saving. According to this measurement, the average personal saving rate from the mid-1970s to the mid-1980s was actually slightly negative. As regards the long-term trend in private saving, personal saving accounts for most of the secular decline in the adjusted private saving series.

6. Social security

The NIPA treat benefit payments from state and local government pensions and from social security as private disposable income and regards contributions to these plans as public saving rather than private saving. Thus, official measures of private saving fail to account for the accumulation of social security wealth by the private sector. At the same time, public saving does not reflect the pension liabilities that the Government incurs. ^{2/} Under this approach, social security contributions are viewed as payroll tax payments while benefit payments are regarded as transfers from a social entitlement program-- rather than as contributions to, and payments from, a pension fund.

Blades and Sturm (1982) and Hendershott and Peek (1987) adjust private and public saving for the effects of social security Old-Age and Survivors Insurance (OASI) on the assets and liabilities of the private

^{1/} Inflation adjusted saving is computed by subtracting from NIPA saving the product of the inflation rate (as measured by the GNP deflator) and net interest bearing assets. Hendershott and Peek (1987) criticize this procedure because of two reasons. First, the procedure assumes immediate adjustment of interest income to the current anticipated inflation rate. In fact, interest income adjusts only slowly, especially if a significant part of fixed coupon assets and liabilities are long term. Second, the procedure ignores tax liabilities incurred on nominal interest income. In view of these two reasons, the inflation adjusted series probably overestimates the effect of inflation on saving measures.

^{2/} To illustrate, the state and local government surplus largely reflects the cash flow surplus of pension funds which are simultaneously accruing future liabilities.

and public sectors. 1/ If the Government had recorded social security contributions as payments for the purchase of social security bonds, which indicate the prospective claim by the private sector on the social security system, the Government would have recorded deficits in excess of \$300 billion in several of the previous 20 years. Estimates of the unfunded social security liability owed by the Government to the private sector exceed estimates of the Government's official debt liabilities.

If social security contributions are to be included in a measure of private saving, they perhaps should be accounted for separately because of a variety of reasons. 2/ First, the risk properties of social security benefits are rather different from those on official debt. Future social security benefits are not contractual obligations in the same way as regular public debt instruments are because they cannot be traded in a market place and because Congress can modify social security benefits by changing the benefit formulae. 3/ Second, estimating social security wealth as perceived by the private sector is a highly complicated exercise because it depends on a variety of necessarily tenuous assumptions.

7. Summary

This section has discussed various issues regarding the measurement of saving. Although counting consumer durables and government investment as saving raises the level of national saving somewhat, the main observation derived from the NIPA series remains: net national saving in the United States has trended downwards over the last two decades because of three main forces. First, and most importantly, public saving fell sharply in the 1980s. Second, private saving has been on a downward trend since the early 1960s, mainly due to declining personal saving. Third, depreciation allowances have risen since the mid-1970s.

1/ According to Auerbach and Kotlikoff (1987) the "pay-as-you-go" financing of the U.S. social security system provides an example of the arbitrary nature of government accounting. They argue that current accounting definitions provide a misleading guide as to whether certain government receipts should be labeled as taxes and others as borrowing or whether certain public outlays are spending or repayment of loans. According to them, indicators of fiscal policy should focus on their ultimate impact on household budget constraints.

2/ Similarly, the Government should not add its social security liabilities to its regular national debt. Instead, it could provide separate supplemental information concerning its potential future liabilities on account of social security.

3/ Policymakers can also change the real return on regular debt instruments by affecting the rate of inflation. However, characteristics of regular debt instruments with respect to inflation risks are likely to be different from those of social security benefits.

IV. Models of Personal Saving Behavior

This section describes the main theoretical models that have been used to explain personal saving behavior and deals with some of the empirical studies that have been undertaken to test to what extent these models explain observed saving behavior in the United States.

The most popular vehicle for analyzing personal saving is the life-cycle or permanent income model. According to this model, households maximize the utility of consumption over their life time subject to an intertemporal wealth constraint. 1/ The basic result from this model is that households are likely to dissave when they are young, then save in their middle years, and finally dissave again during retirement. The model introduces wealth and demographic variables as important determinants of aggregate saving behavior. In its purest form, the model assumes that individuals plan to consume all the fruits of their labor earnings during retirement without leaving any bequests.

Several studies have questioned the assumptions underlying the pure life-cycle model. Some observed that individuals transfer significant amounts of wealth to their offspring. 2/ An alternative model, which attempts to explain these observed intergenerational transfers, has been popularized by Barro (1974) and extends all the way back to Ricardo. 3/ This model of intergenerational altruism assumes that individuals internalize the welfare of their heirs and intend to leave bequests. However, several implications of this model have been rejected by the data. 4/ Moreover, it is not clear whether individuals intend to leave bequests or whether uncertainty about death combined with a weak market for private annuities causes individuals to end up leaving unspent savings for their offspring. 5/

A major tenet of the pure life-cycle model--namely that households dissave during retirement--has been questioned on the grounds that cross-section data indicated that the wealth of the elderly increases with age. 6/ Bernheim (1987) and Hurd (1987), however, used panel data to demonstrate that the elderly actually dissave during retirement. The

1/ See, for example, Ando and Modigliani (1963).

2/ See, for example, Kotlikoff and Summers (1981) and Kotlikoff (1987). The former study contained an error. Even if this error was corrected, however, life cycle saving accounted for only half of total capital accumulation. Using a somewhat different methodology, Modigliani (1988), argues that bequests account for only about 20 percent of total wealth.

3/ The Ricardian equivalence literature is discussed more fully in Ebrill and Evans (1988).

4/ See, for example, Boskin and Kotlikoff (1985), and Bernheim (1987).

5/ See, for example, Davies (1981).

6/ See, for example, Kurz (1984).

tentative conclusion from this literature is that, in contrast to what the intergenerational altruism model predicts, the propensity to consume varies with age. In particular, the elderly dissave but they appear to do so at a rate that leaves, with some frequency, an expected bequest. 1/

Several studies observe that the close empirical relationship between consumption and income is difficult to explain by individuals maximizing intertemporal utility over a long time horizon. 2/ Some have attributed this finding to imperfect capital markets which prevent individuals from fully smoothing their consumption over time. 3/ Others explain the close relationship between current income and consumption by rejecting the basic premises of intertemporal utility maximization, extreme rationality, and farsightedness. 4/ They argue that myopia, rules-of-thumb, precautionary saving, habit, target saving for the purchase of large durable goods, etc., play a dominant role in determining aggregate saving.

The conclusion from the empirical literature reviewed in this section is that none of the relatively simple theories appears capable, by itself, of explaining aggregate savings behavior. Instead, several elements play a role in explaining aggregate saving behavior because different households seem to act in different ways: some behave as life-cycle optimizers, some as intergenerational planners, and others much more myopically than any of the intertemporal optimizing theories suggest. 5/ Saving behavior in the short run appears to be broadly consistent with Keynesian analysis, which emphasizes the importance of current income. Over a longer time horizon, both life cycle and bequest saving play important roles with recent evidence generally indicating a more powerful role for the life-cycle model. Consequently, the predominant model for analysis of longer-term issues remains the life-cycle model, in part because no consensus has emerged on how to model intergenerational transfers.

1/ See Boskin (1988).

2/ See, for example, Hall and Mishkin (1982), Poterba and Summers (1987), and Summers and Carroll (1989).

3/ See, for example, Hubbard and Judd (1986).

4/ See, for example, Summers and Carroll (1987a).

5/ To illustrate, Boskin (1988) argues that the effect of changes in current disposable income on current consumption is considerably less than the traditional Keynesian marginal propensity to consume of 0.75. However, the effect significantly exceeds zero, which is the value the model of intergenerational altruism predicts, and about 0.05, which follows from a model with unconstrained intertemporal optimizing households.

V. Explanations for the Downward Trend in Personal Saving

This section examines several possible explanations for the downward trend in the U.S. personal saving rate. The approach taken is eclectic in the sense that it borrows from various theories. In particular, it allows for various savings motives such as saving for retirement and bequests as well as precautionary saving and target saving for the purchase of major consumer durables.

1. Wealth effects

According to the life-cycle hypothesis, individuals reduce their savings if capital gains improve their net wealth positions, 1/ with this effect especially important for the elderly. In the 1980s, thus far (1980-88), household wealth has averaged 4.4 times disposable income compared with 4.2 times in the 1970s, an increase which would be likely to lead to a fall in the household saving rate.

Rising stock market values added significant amounts to household wealth during the period 1982-87. Moreover, they enabled employers to contribute less to their defined benefit pension plans and still meet their pension obligations. In effect, pension funds act like pure target savers. Hence, a rising rate of return yields a negative income effect without any offsetting positive substitution effect. 2/

Table 4 compares the contribution to household wealth accumulation of these equity gains with that of personal saving out of current income during the 1980-86 period in four major industrial countries. This table suggests that capital gains substituted for saving out of current income. In particular, sharply declining saving rates in the United States and the United Kingdom were associated with the largest gains in stock market values. It should be noted that these accrued capital gains added to household wealth but did not provide new funds for real investment in the corporate sector.

The stock market boom may have reflected several factors. First, rising corporate savings (see Table 1) tended to raise share values. Some studies suggest that corporate saving substitutes for personal savings mainly through this channel. 3/ Second, more optimistic expectations regarding future profitability of corporate assets, due to both

1/ The Annual Report of the Council of Economic Advisers (1987, pp. 43-45) stresses rising real household wealth as a factor behind the low rate of personal saving out of current income.

2/ Bernheim and Shoven (1985) estimate that this effect reduced personal saving by about 2 percent of disposable income from 1982 to 1984.

3/ See, for example, Hendershott and Peek (1987). Bovenberg (1989) discusses the relationship between personal and corporate saving in more detail.

more efficient structural policies (such as tax reform increasing overall efficiency) and declining inflation rates, may also have contributed to higher stock prices. 1/

The sharp increase in housing prices in the inflationary period of the mid-to-late 1970s is likely to have had a significant negative effect on the personal saving rate. Summers and Carroll (1987a) show that the adverse savings effect of rising housing wealth exceeds that of rising stock market wealth. Two factors may explain this empirical result. First, households often borrow against appreciated properties. 2/ Second, the elderly, who are generally characterized by a larger marginal propensity to consume out of an increase in wealth, tend to realize most of the capital gains on housing.

Several studies attributed the housing boom in the second half of the 1970s to accelerating inflation that raised tax incentives favoring housing. Summers and Carroll (1987b), for example, compare the saving performance of the United States with that of Canada, which does not allow tax deductibility of mortgage interest payments. They show that increasing inflation rates widened the gap in after-tax real interest rates on mortgages between Canada and the United States to 8 percentage points by 1981. The diverging tax incentives caused housing prices in the United States to rise relative to those in Canada, 3/ and thus may have depressed the relative saving performance of the United States.

Empirical studies generally suggest that movements in wealth are a major determinant of saving behavior. Hendershott and Peek (1985b) find that wealth and income are the most important variables explaining long-run swings in personal saving. In particular, rising wealth explains most of the decline in the private saving rate during the period 1975-82. Empirical results in Montgomery (1986) indicate that increases in wealth and in expected future income relative to current income, account for about 40 percent of the fall in the personal saving rate during this period.

1/ More generally, saving declines if households come to believe that structural policies will bring about higher future income because of a more efficient use of resources and higher overall productivity. Within the group of seven major industrial countries, the household saving rate fell most sharply during the 1980s in the United States and the United Kingdom, which were the two countries that implemented most of the structural reforms during this period. Tanzi and Bovenberg (1989) discuss how structural policies may affect saving, investment, and international capital flows.

2/ The recent increase in home equity loans illustrates this.

3/ Housing demand strongly affects the value of real estate because the supply of housing is inelastic in the short run.

2. Social security pensions and improvements
in living standards of the elderly

Retirement benefits from social security currently represent almost 5 percent of GNP and are projected to increase rapidly in the decades ahead as the share of retirees in the population rises. The ratio of the average social security benefits per elderly person to per capita disposable income rose from 2 percent in 1950 to 30 percent in 1970 and reached 40 percent in 1985 (Table 5). The present value of prospective social security benefit payments now represents about a third of the wealth of the elderly. ^{1/}

Social security, which amounts to a compulsory public pension scheme, affects private saving through a number of channels. First, the expansion of the scheme redistributed income toward the elderly, ^{2/} who have a relatively large marginal propensity to consume. ^{3/} Second, the life-cycle model predicts that anticipated social security pensions reduce the need for private retirement saving, although an increased incentive to retire earlier may partly offset the weakened motive for private saving. Moreover, Hubbard (1984 and 1986) demonstrates that social security pensions provide insurance for retirement consumption in the face of uncertain lifetimes. In particular, these pensions reduce the uncertainty regarding the necessary amount of savings for retirement. Thus, these pensions could depress precautionary saving, thereby reinforcing the adverse effects of social security on life-cycle saving.

The effect of social security pensions on national saving (rather than on private savings) depends on whether, and how, the government funds these pensions. A pension fund is fully funded if the discounted present value of all future obligations corresponds to the value of real assets owned by the fund. Until recently, the "pay-as-you-go" social security system in the United States was purely unfunded: the discounted present value of future payments was expected to be matched not by real assets but by the discounted value of future contributions. Thus, public saving failed to offset the decline in private saving.

^{1/} See, for example, Shoven (1984).

^{2/} Those who retired in the past several decades and those who will retire in the near future can expect to receive a return on their social security contributions that significantly exceeds the return they would have received on investments in financial markets. Those who are currently entering the workforce, in contrast, cannot expect to receive as much in return for their social security contributions as they could obtain by investing in financial market instruments.

^{3/} Evans (1983b) emphasized this channel.

Consequently, social security may have depressed national wealth accumulation. 1/

After the reform of the retirement and disability portions of social security (OASDI) in 1983, the social security pension scheme is no longer a pure "pay-as-you-go" system. In particular, the social security trust fund is projected to run sizable cash surpluses in the next several decades leading to a build up of a reserve. This reserve is expected to be drawn down when the exceptionally large baby boom generation retires in the next century, so that this generation contributes to its own retirement benefits rather than shift the financing burden of these benefits to smaller future generations.

However, the accumulation of a trust fund, large as it will be, may fail to raise public and national saving relative to a pure "pay-as-you-go" system (which would rely on increased taxes on future generations to fund the retirement benefits of the baby boom generation) if the social security surpluses were to be used to finance higher public expenditures or lower taxes than would have been the case under a "pay-as-you-go" system. 2/ Moreover, financing the fiscal deficit (excluding social security) with the surpluses in the social security trust fund implies that the social security payroll tax is used to finance lower income taxes and higher public expenditures. Increases in social security payroll tax rates, which have occurred in recent years, tend to have adverse incentive effects on labor supply and may also restrain labor demand; therefore, they are inconsistent with personal and corporate income tax reforms aimed at reducing marginal effective tax rates.

Empirical studies on the saving effect of unfunded pension schemes, which date back to Feldstein (1974), are inconclusive and are hampered by numerous methodological difficulties. 3/ Auerbach and Kotlikoff (1981) illustrated some of these empirical difficulties when they generated artificial data from a life cycle model in which the unfunded

1/ According to the model of intergenerational altruism, an unfunded pension scheme fails to depress national wealth accumulation. In this model the private sector will offset the changes in intergenerational transfers induced by the pension scheme.

2/ The issue raised here is not purely theoretical because the inclusion of these surpluses in the Gramm-Rudman-Hollings targets for deficit reduction suggests that such a scenario is not altogether unlikely. If that is indeed the case, future generations will face major fiscal disequilibria (and the burden of higher taxes or lower public expenditures aimed at reducing these fiscal imbalances) when the baby boom generation retires. Such a development would largely defeat the purpose of the social security trust fund.

3/ Aaron (1983), Sturm (1983), and Shoven (1984) survey the main empirical studies in this area.

social security system depresses private saving. Nevertheless, econometric tests tended to reject the hypothesis that the system reduced personal saving.

Summers and Carroll (1987a) argue that studies of year-to-year movements in consumption cannot provide much insight on the saving effects of social security because these effects depend on perceptions about future benefits that are likely to respond slowly to legislative changes. ^{1/} They maintain that the gradual improvement in the relative income of the elderly (see Table 5), which is largely due to the sharply increasing social security benefits over the last three decades, has reduced the perceived need of the younger generations to save for retirement. With their recollection of the depression and World War II, the older generations feel a greater need to save for retirement and as a buffer against risk. Summers and Carroll argue that this is probably the single most important factor explaining the secular decline in the private saving rate over the last two decades. ^{2/} Boskin and Lau (1988) provide some empirical support for these arguments. They show that, holding all other variables (including age) constant, the savings rate of households headed by persons born before 1939 significantly exceeds the savings rates of those cohorts of households headed by persons born after 1939.

Despite empirical difficulties in measuring the saving impact of social security pensions, Boskin (1988) argues that the consensus from the empirical literature is that each dollar of social security wealth, measured as the discounted value of social security benefits, depresses private wealth by about \$0.25 to \$0.50.

3. Improved insurance

Insurance arrangements directly enhance the ability of households to guard against uncertainty and, therefore, reduce the need for precautionary saving. ^{3/} The previous subsection noted that social security pensions insure against life span uncertainty, thereby reducing the need for private precautionary saving. In addition to annuity insurance,

^{1/} The recent restructuring of the social security system that put the Old Age Survivors and Disability Insurance (OASDI) on a sounder financial footing provides an interesting example of this point. If the younger generations gradually come to believe that the OASDI is more financially sound than originally believed, they may reduce their retirement saving over time.

^{2/} They observe that a slight worsening of the relative income position of the elderly accompanied rising private saving rates in the 1950s. When the relative income of the elderly started to improve in the mid-1960s, private saving began to trend downward.

^{3/} Moreover, the introduction of actuarially fair insurance schemes can raise life-time welfare if individuals are risk averse. This welfare effect may raise consumption and reduce saving.

various other types of insurance--including unemployment insurance, disability insurance, and health insurance--have substantially improved in the post-war period. These improvements may also have reduced precautionary saving.

Most of this growing insurance has been provided by the public sector through social programs, such as Medicare, which covers health care for the elderly, and Medicaid, which pays for the health care of low-income individuals, 1/ both introduced in the mid-1960s. Health care spending through these programs has increased to almost 2.5 percent of GNP.

Some factors mitigate the adverse effect of improved insurance schemes on precautionary saving. First, in the past the extended family had provided implicit insurance, 2/ and to the extent that expanding explicit insurance schemes have replaced such implicit insurance mechanisms, they may not have reduced the need for precautionary saving. Second, rising costs of health care raised the need for precautionary saving. In fact, despite the increasing share of medical expenses covered by insurance schemes, the income share devoted to uninsured health care has not declined (see, e.g., Summers and Carroll (1987a)). 3/

On balance, expanding public insurance schemes are likely to have reduced national saving despite some offsetting factors, especially because the public sector has failed to increase its saving in order to offset the adverse effects of its insurance programs on private

1/ According to Kotlikoff (1986), the availability of Medicaid may substantially reduce savings of lower-income groups. For middle-income and upper-income households, in contrast, health expenditures still represent a major uninsured risk, thereby inducing significant precautionary savings by these income groups.

2/ See, for example, Kotlikoff and Spivak (1981).

3/ Feldstein (1986) argues that both improved social insurance and tax arrangements favoring private health insurance played a major role in raising health care costs by increasing demand for health services and reducing competitive pressures to keep medical costs down. As regards tax incentives, employer payments for health insurance are deductible for corporate tax purposes but are not included in the taxable income of employees. This tax rule, which reduces annual tax collections by about \$30 billion, according to official estimates, substantially reduces the after-tax cost of purchasing health insurance. Through this provision, the tax system subsidizes precautionary private savings while at the same time distorting the allocation of private savings.

saving. ^{1/} In effect, a claim on future taxpayers was substituted for real capital formation.

4. Demographic trends

According to the life cycle model, the aggregate saving ratio depends on a number of demographic variables. One of these factors is the age distribution of households because individual household saving ratios tend to vary with the age of the households. Households in the 20 to 35 year age group typically save a lower share of their disposable income than older households who have not yet retired. ^{2/} This differential saving behavior arises because the members of the younger age group have not yet reached their peak earning levels while they spend more on child rearing and on durable goods. The coming of age of the baby boom generation has increased the population share of the 20 to 35 year age group during the past two decades, thereby tending to depress aggregate personal saving. At the same time, the population share of retired households, which are also characterized by relatively low saving rates, has risen as well. This trend reinforced the adverse effects of the changing age distribution on total private saving.

Empirical studies suggest that the changing age composition of the population has significantly reduced aggregate saving over the past 20 years. Montgomery (1986), for example, estimates that the increasing population share of the 25 to 35 year age group accounts for about a quarter of the decline in the personal saving rate during the 1975-82 period. Hendershott and Peek (1987) find that the rising share of the age group of 65 years and older significantly depressed saving between 1953 and 1982. These empirical estimates need to be interpreted with care, however, because the demographic variables may capture effects of other, omitted, variables. According to Summers and Carroll (1987a), the variation in saving rates and income shares received by different age groups is insufficient to explain very large changes in aggregate

^{1/} Other government programs that support higher education and home ownership may also replace private saving, and, if public saving is not increased, reduce national wealth accumulation. These effects on private saving illustrate an important point: the national saving effects of public expenditures are not limited to their budgetary costs and their direct effect on the budget deficit. Even if the Government prevents public expenditures from increasing the fiscal deficit through raising taxes, expenditures may depress national saving by reducing private saving. It may be noted that those public expenditures that may tend to reduce private saving, such as public retirement and disability programs, unemployment insurance, student aid, and housing assistance, account for much of the growth of public spending over the past 20 years.

^{2/} According to the 1984 consumer expenditure survey, personal savings rates varied between -17 percent for the 18-24 age group and 13 percent for the 55-64 age group.

saving rates. Furthermore, other demographic factors may act to (partly) offset the negative saving effect of the changing age composition. For example, the increase in life expectancy and the decline in the retirement age raise the need for retirement saving because these factors lengthen the expected retirement period.

Other demographic variables affecting total personal saving are family size and the female participation rate in the labor force. As fertility fell, the average family size has been declining over the previous years. This development reduced the need to save for bequests, including implicit bequests in the form of expenses for child rearing and education (see, e.g., Boskin (1986)). Some studies (see, e.g., Sturm (1983)) have argued that the rising female participation rate contributed to the decline in saving both by increasing the access to consumer credit and by reducing the variability of incomes. ^{1/}

5. More efficient and integrated capital markets

Capital market imperfections reduce the availability of credit to certain sectors or segments of the population. These imperfections, therefore, limit the ability of young households to smooth their lifetime consumption by borrowing, thereby increasing aggregate saving. In addition, they raise target saving for the purchase of major consumer durables by forcing households to finance these purchases by accumulating a sizable down payment rather than by borrowing. If capital markets develop and become more efficient, some of the restrictions on borrowing are relieved and, consequently, aggregate saving may decline. ^{2/} The size of the decline may be substantial during a transition period when liabilities adjust to a new structure of capital markets.

Several studies have attributed some of the decline in the personal saving rate over the past decades to increased credit availability for households. ^{3/} Consumers have been taking on an increasing amount of debt. As a ratio of disposable income, consumer and mortgage credit have risen by about 50 percent since the mid-1950s. At the same time, the average down payment for first-time home buyers has fallen relative to median family income.

^{1/} The latter factor reduced the need for precautionary saving.

^{2/} To the extent that more efficient capital markets raise rates of returns on financial assets, savers may raise their level of saving. More importantly, they may increase the share of financial assets in their portfolios. These positive effects on the accumulation of financial assets may (partly) offset the increase in financial liabilities. However, more efficient insurance markets are likely to decrease precautionary saving. See Hubbard and Judd (1986) and subsection V.3.

^{3/} See, for example, OECD (1979), Bosworth (1981), Sturm (1983), and Summers and Carroll (1987a).

The increasing international integration of financial markets may have made a one-time contribution to the continued decline of the personal savings rate during the 1980s. The Japanese liberalization of capital outflows allowed U.S. individuals and corporations as well as public entities to borrow at lower after-tax interest rates than would have been the case if Japanese savings had not been made available to world capital markets. ^{1/}

The process of corporate restructuring in the 1980s which has produced windfall gains for households is another channel through which financial innovation may have influenced saving behavior. To the extent that these windfall gains boosted consumption, they may have contributed to a decline in personal saving. Hatsopoulos, Krugman and Poterba (1989) find this effect to be quite large, although the relevant coefficient is not statistically significant at conventional levels. Fries (1989) finds statistically significant effects of this kind, but of smaller economic magnitude.

6. The role of real after-tax interest rates

The importance of changes in real after-tax interest rates in the determination of household consumption and saving in the United States has long been a matter of controversy. At a theoretical level, two period life cycle models indicate the existence of potentially offsetting income and substitution effects. Summers (1981) proposed that in a realistically formulated multi-period life cycle model, a large positive interest elasticity of saving was likely. Evans (1983a) countered by noting that Summers' results stemmed in part from a restrictive choice of parameters, and added that the incorporation of a bequest motive made a negative interest elasticity of saving plausible. At the empirical level, some studies (for example, Boskin (1978)) have suggested a significant positive effect of real after-tax interest rates on household saving while others (for example, Friend and Hasbrouck (1983)) indicate an effect close to zero. Overall, no consensus appears to exist on the magnitude or significance of the effect.

7. The role of inflation

As noted in subsection III.4, inflation raises some issues of measurement. Inflation may also affect saving by reducing the real after-tax rate of return. However, inflation may raise personal saving through several other channels. In particular, personal saving may rise in an inflationary environment if consumers mistake nominal for real price increases (see, e.g., Deaton (1977)). Furthermore, when inflation raises uncertainty regarding future incomes, risk-averse households may save more (see, e.g., Sandmo (1970)). Inflation may also reduce

^{1/} Such liberalization can result in sizable capital flows during the transition to a new stock equilibrium. For a description of the Japanese liberalization measures, see Fukao (1988).

consumption of indebted households who face liquidity constraints because the inflation premium in nominal interest rates forces these households to accelerate the repayment of their real debt. Indeed, assuming a fixed real after-tax return, most empirical studies find that inflation significantly raises saving. ^{1/}

VI. An Empirical Analysis of Personal Saving

As noted in Section II, the personal saving rate in the United States has been very low in the last several years by comparison with earlier decades. In 1987 and 1988, it averaged 3 1/2 percent of disposable income compared with just over 7 percent from 1950 to 1979 (Table 1). This section presents results from a simple empirical framework designed to assess the magnitude of some of the main influences on U.S. personal saving in the 1980s.

1. Estimation

According to the conventional permanent income/life cycle hypothesis, aggregate consumption should be related to labor income and wealth, with a possible role also for real rates of return. In most empirical applications, personal disposable income is used as a proxy for labor income. The coefficients on income and wealth in aggregate equations in principle need not be constant but rather may themselves evolve gradually over time in response to demographic developments and other structural changes.

In the simple empirical framework to be presented below, the underlying long-run relationship reflects the life cycle/permanent income approach, while a more agnostic view is taken of short-run adjustments around the long-run relationship. A flexible distributed lag model is estimated, using a testing down procedure that drops statistically insignificant higher order lags. The underlying approach is in the tradition of the error correction models pioneered by Hendry and others. ^{2/} This approach has proven particularly fruitful in generating models consistent with observed data patterns and yet embodying the long-run relationships implied by economic theory.

Much previous empirical research on U.S. consumption and saving has estimated separate equations for pure consumption and spending on consumer durables, which were then linked in a small model. However, in this paper, consumer spending is modeled as an aggregate, without separate specifications for nondurables and services, and durable goods. Darby, among others, has argued that an overall consumer expenditure

^{1/} For saving in the United States, see Blinder and Deaton (1985) and Montgomery (1986). For other industrial countries, see Dean et al (1989).

^{2/} See Davidson et al (1978), Hendry et al (1984), and Hendry (1986).

function may better represent the data and have superior predictive power compared with a disaggregated approach. 1/

The results from estimating an aggregate equation for consumer spending are presented below.

$$\begin{aligned} \Delta \log C = & -0.379 \log C_{-1} + 0.310 \log Y_{-1} + 0.041 \log W_{-2} \\ & (5.6) \quad (5.7) \quad (2.1) \\ & + 0.374 \Delta \log Y + 0.069 \Delta \log W_{-1} \\ & (5.9) \quad (3.9) \\ & - 0.0024 \cdot \text{PIPC}_{-1} - 0.00190 R_{-1} \\ & (5.9) \quad (3.9) \\ & - 0.00122 \cdot \text{N20}_{-1} - 0.00195 \cdot \text{N2065}_{-1} \\ & (2.4) \quad (2.9) \\ & + 0.01272 \cdot \text{N65}_{-1} \\ & (3.1) \end{aligned}$$

$$\bar{R}^2 = 0.471; \text{SE} = 0.0053$$

The equation was estimated by OLS on quarterly data from 1960 (1) to 1988(4). Notation is as follows:

- C = real per capita consumer spending 2/
- Y = real per capita disposable income 2/
- W = real per capita household net worth 2/
- PIPC = four-quarter rate of inflation in terms of the consumption deflator
- R = real after tax interest rate (defined as one minus a marginal tax rate 3/ times the three-month Treasury bill interest rate less PIPC)

1/ See Darby (1975 and 1977/78).

2/ Deflated by the implicit deflator for consumer spending and population.

3/ The time series for the marginal tax rate was the average marginal tax rate for a four person family on median family income, provided by the Office of Tax Analysis, U.S. Treasury.

N20 = the percentage share of the population below age 20

N2065 = the percentage share of the population between the ages of 20 and 65

N65 = the percentage share of the population over the age of 65

Log denotes natural logarithm; \bar{R}^2 the adjusted coefficient of determination; SEE is the standard error of the equation; figures in parentheses are t-statistics and Δ denotes first difference. 1/

Noteworthy features of the estimated equation (beyond the statistical significance of the income and wealth terms) are the strong statistical significance of the inflation rate, the real rate of interest, and the demographic terms. 2/ Attempts were made to allow for an effect from the stock of consumer durable goods, but the variable did not enter significantly and was dropped. The estimated equation satisfies a range of diagnostic tests relating to serial correlation, heteroskedasticity, and non-normality of the error terms. When a standard Chow test of parameter stability was conducted, comparing the equation estimated on the period through 1980 to that estimated on the full sample through 1988, the hypothesis of parameter stability was not rejected. 3/

The long-run relationship which can be derived from the estimated equation is as follows: 4/

1/ The equation was estimated in both PC-GIVE and AREMOS. The diagnostic tests were performed in PC-GIVE while the simulation results (reported later) were generated in AREMOS. All data were taken from DRI data banks in June 1989.

2/ In alternative estimated equations, not reported here, the term covering the population share between the ages of 20 and 65 was subdivided further without a major effect on the thrust of the results.

3/ The calculated F-statistic was 1.08, distributed with (32,74) degrees of freedom; this is not significant at 5 percent. When a Chow test of coefficient stability was performed with the split in mid-1974--dividing the sample into equal halves--again the hypothesis of parameter stability was not rejected. The Chow test is known to be of low power and passing such a test--though a necessary requirement for stability--is not sufficient to rule out the possibility of a break in behavior.

4/ By setting the difference terms to zero to obtain a steady state. If the difference terms are set to their average values over the sample instead, a small constant enters the long-run relationship.

$$\begin{aligned}
 \log C = & 0.819.\log Y + 0.108.\log W \\
 & - 0.0063.PIPC - 0.0050.R \\
 & - 0.0032.N20 - 0.0051.N2065 \\
 & + 0.034.N65
 \end{aligned}
 \tag{1}$$

As a final step, the long-run relationship (from equation (1) above) was re-entered for estimation, to make the error-correction mechanism more transparent. The estimated equation was as follows:

$$\begin{aligned}
 \Delta \log C = & - 0.381 (\log C_{-1} - \log C_{-1}^*) \\
 & \quad (9.4) \\
 & + 0.069.\Delta \log W_{-1} \\
 & \quad (2.8) \\
 & + 0.376.\Delta \log Y \\
 & \quad (8.2)
 \end{aligned}$$

$$\bar{R}^2 = 0.504; \quad SE = 0.0051;$$

Sample period 1960 (1) to 1988 (4).

Notation is as before and in addition C^* is the fitted value in the derived long-run relationship (equation (1) above). The error correction term represents the gap between actual consumer spending last period and its long-run value. The estimated coefficient on this term (-0.34) indicates the proportion of the discrepancy in the previous period likely to be corrected in the current period.

The coefficients on income and wealth in the long-run equation can be directly interpreted as elasticities, while those on inflation and the real rate of interest are semi-elasticities. The inflation coefficient implies that a 1 percentage point increase in the steady state inflation rate is likely to lead to 0.6 percent long-run decline in consumption compared with what it would otherwise have been; this result would in turn imply an increase in the saving rate by about 1/2 percentage point in the long run. ^{1/}

^{1/} The coefficient on the real interest rate is very similar in size to that on the inflation rate. This may imply that consumption depends on nominal rates of return without much of an independent role for real rates of return and inflation. This finding is similar to that in Blinder and Deaton (1985).

The coefficient on the real rate of interest indicates that a permanent 1 percentage point permanent rise in the real after-tax rate of interest would reduce consumption by 0.5 percent relative to its level otherwise, which in turn would lead to a rise in saving of about 0.5 percent of disposable income in the long run. The demographic variables are linked by an identity (they sum to 100 percent). The strong significance of the coefficient on the share of the population over the age of 65 could reflect more than pure demographic effects. For example, the increased share of disposable income accruing to older households--partially stemming from demographic effects but also from increased generosity of the social security system--could well exert a depressing effect on the saving rate, and might be picked up by this population term. Such effects are inevitably difficult to separate empirically. ^{1/}

2. Simulation results

The consumer expenditure equation was linked with identities to yield a simple model of personal saving for simulation purposes. ^{2/} The model was then used for several illustrative simulation experiments. First, a baseline simulation was conducted over the period from 1970-88, to examine tracking performance. Then, several counterfactual experiments were conducted to examine the contributions of movements in the various explanatory variables in the 1980s. ^{3/}

The results of the baseline and alternative simulations are presented in Table 6. The framework tracks the decline in the personal saving rate in the first half of the 1980s reasonably well, predicting a fall from an average 8 percent of disposable income in the 1970s to 3 1/2 percent in the last three years (1986-88), compared with the movement from 8 percent to 3 3/4 percent of disposable income that actually occurred (columns (1) and (2) of Table 6). However, the saving rate was underpredicted by over 1/2 percentage point of disposable income in 1987 and 1988.

In the 1970s, household wealth was low as a ratio to disposable income, in part because of the depressed state of the stock market. In the first counterfactual simulation, household wealth in the 1980s was taken to average 4.17 times disposable income (the average ratio from the 1970s) to examine the effect of more robust wealth performance in

^{1/} See also Evans (1983b).

^{2/} The implicit deflator for consumer spending, disposable income, and the wedge between disposable income, consumer spending and saving (interest paid by consumers to business and personal transfers to foreigners) were all assumed exogenous at actual values, unless otherwise stated in the simulation.

^{3/} The counterfactual simulations were static in the sense that feedback from saving to wealth was not incorporated. However, they were dynamic in the respect that for simulation purposes lagged consumer spending was treated as endogenous.

the 1980s. 1/ According to the simulation results, the increase in the wealth/income ratio in the 1980s led to a reduction in the personal saving rate, with the magnitude of the effect ranging between 1/2 and 2/3 percentage points in the years 1986-88 (column (4) of Table 6).

In the next simulation experiment, the steady state inflation rate (in terms of the implicit deflator for consumer spending) in the 1980s was held fixed at 6.7 percent (its average value in the 1970s), compared with its actual path which showed a decline from over 10 percent in 1980 to the neighborhood of 4 percent in 1987 and 1988. 2/ According to these results, the high inflation in the early 1980s compared with the 1970s contributed positively to the personal saving rate, while a lower inflation more recently than in the 1970s subtracted from personal saving--by an average 2 percent of disposable income in 1986-87, and by 1 1/4 percent of disposable income in 1988 (column (5) of Table 6).

In the 1970s the real after-tax interest rate averaged -1.7 percent compared with an average plus 1.6 percent from 1980 to 1988. 3/ The next simulation experiment held the real interest rate fixed at -1.7 percent in the 1980s. The results indicate that higher interest rates in the 1980s may have prevented the household saving rate from falling by more than it actually did. According to the simulation, the fact that real interest rates were higher in the 1980s than in the 1970s boosted the saving rate by 1 1/2 percentage point on average during 1986-88 (column (6) of Table 6).

In the 1970s, persons under age 20 represented 37 percent of the U.S. population, while those between the ages of 20 and 65 comprised 53 percent, and those aged 65 and over made up the remaining 10 percent. In the period 1980-88, the population share of the 65 and over group rose to 11 percent, that under age 20 fell to 32 percent, and the middle group share increased to 57 percent. In the simulation experiment reported here, the demographic shares were held at their average values of the 1970s, while other variables kept their actual values. 4/

1/ From 1980 to 1988, household wealth averaged 4.38 times disposable income.

2/ The experiment assumed that the inflation was fully foreseen so that real income, real wealth, and real interest rates equalled historical values.

3/ As noted earlier, defined here as one minus a marginal tax rate times the three-month Treasury bill interest rate, less the four-quarter percentage change in the consumer spending deflator.

4/ This experiment is admittedly somewhat artificial since demographic shifts do not work independently of propensities to consume out of income and wealth but rather should lead to gradual movements in these coefficients over time.

According to the results, changes in demographic structure--especially the increasing proportion of the population over age 65 which has the largest estimated coefficient--contributed to a substantial decline in the household saving rate in the 1980s, with the magnitude of the effect drifting upward over time (column (7) of Table 6). By the last three years (1986-88), the household saving rate was on average 4 1/2 percentage points of disposable income lower than had the average demographic structure from the 1970s remained in place.

As with all empirical research, the results just presented are model specific. According to the empirical results presented, the largest contributing factor to the decline in the personal saving rate from an average 8 percent of disposable income in the 1970s to 3 3/4 percent in the last three years is a change in the demographic structure--especially the rise in the share of the population over the age of 65. Demographic movements accounted for a decline in the savings rate of 4 1/2 percentage points. A higher wealth/income ratio in 1986-88 compared with the 1970s subtracted about 1/2 percentage point from the saving rate; the lower inflation rate in 1986-88 subtracted 1 1/2 percentage points compared with the 1970s, while the higher after-tax real interest rate was associated with the savings rate being 1 1/2 percentage point higher in 1986-88 than otherwise.

VII. Conclusions

In the period 1986-88, the U.S. net national saving rate averaged just over 2 percent of NNP, compared with 8 1/4 percent during 1950-79. The lower national saving rate was associated with a pronounced deterioration in public saving and a marked decline in net private saving, with the latter stemming primarily from a fall in the personal saving rate. Of course, it can be argued that national accounts measures of saving may be flawed in several ways. However, even after various adjustments are made to allow for alternative approaches to measuring saving, the central conclusions emerge unscathed, namely that declines in both gross and net personal savings rates have contributed importantly to the observed reductions in national saving rates.

No single theoretical framework appears able to explain by itself personal saving behavior. An eclectic approach relying on several strands of theory--including Keynesian factors, a life cycle approach, precautionary, target and bequest motives--may be more promising. Empirical studies generally suggest that improvements in wealth positions associated with the rising values of the stock market and housing have been an important factor behind the declining trend in personal saving. More generous social security pensions, improved public and private insurance and larger government programs supporting higher education and home ownership may also have lowered national saving by reducing the need for personal saving. Furthermore, the changing age structure of the population and lower inflation may also have reduced the personal saving rate. Several studies have also attributed some

of the decline in the personal saving rate to more efficient capital markets, which have reduced the need for target saving for the purchase of consumer durable goods. Available studies provide no consensus on the empirical importance of after-tax interest rates in the determination of personal saving, with results ranging from essentially zero significance to an important positive effect.

A simple empirical assessment suggested that demographic factors had played a particularly important role in the decline in the personal saving rate, while an improved wealth position and the decline in inflation in the 1980s were also significant. The increase in real after-tax interest rates in the 1980s appeared to have moderated the fall in the personal saving rate.

Table 1. United States: Saving and Investment, 1950-88

	1950-59	1960-69	1970-79	1980	1981	1982	1983	1984	1985	1986	1987	1988
(In percent of NNP)												
Net national savings	8.1	8.6	7.9	5.8	6.4	2.3	2.2	4.6	2.7	1.7	1.7	2.9
Net private savings	8.2	8.9	8.9	7.2	7.5	6.2	6.5	7.7	6.4	5.6	4.4	5.2
Personal savings	5.2	5.1	6.2	5.6	5.9	5.5	4.3	4.9	3.5	3.3	2.5	3.3
Corporate savings	3.1	3.8	2.7	1.6	1.6	0.7	2.2	2.8	2.9	2.2	1.9	1.8
Net public savings	-0.1	-0.3	-1.1	-1.4	-1.1	-4.0	-4.3	-3.1	-3.7	-3.8	-2.7	-2.2
State and local surplus	-0.3	--	0.9	1.1	1.3	1.3	1.6	1.9	1.8	1.7	1.3	1.1
Federal surplus	0.1	-0.3	-1.9	-2.5	-2.4	-5.2	-5.8	-5.1	-5.5	-5.5	-4.0	-3.3
Total net investment	8.2	7.7	7.6	5.5	6.2	2.3	3.5	7.4	5.8	5.3	5.3	5.4
Plant and equipment	3.4	3.7	3.7	3.7	3.6	2.4	1.5	2.7	2.9	2.1	1.8	...
Residential construction	3.8	2.9	3.0	2.2	1.7	0.8	2.2	2.7	2.6	3.1	2.9	...
Inventory accumulation	1.0	1.1	0.9	-0.3	0.9	-0.9	-0.2	2.0	0.3	0.2	0.6	0.6
Saving-investment surplus												
National saving-investment surplus	-0.1	0.8	0.3	0.3	0.2	--	-1.3	-2.9	-3.1	-3.6	-3.5	-2.4
Private saving-investment surplus	--	1.1	1.3	1.7	1.3	3.9	3.0	0.3	0.6	0.2	-0.8	-0.2
Net foreign investment	0.1	0.7	0.3	0.5	0.4	--	-1.1	-2.7	-3.2	-3.6	-3.7	-2.7
(In percent of GNP)												
Memorandum items												
Capital consumption allowances	8.7	8.4	9.6	11.1	11.4	12.1	11.6	11.0	10.9	10.9	10.8	10.5
Gross national saving	16.1	16.3	16.7	16.2	17.1	14.1	13.6	15.1	13.3	12.4	12.2	13.2
Gross private saving	16.2	16.6	17.6	17.5	18.0	17.6	17.4	17.9	16.6	15.8	14.7	15.1
Gross personal saving ^{1/}	8.7	8.3	9.5	9.5	9.7	9.5	8.4	8.6	7.3	7.1	6.3	6.9
Gross corporate saving ^{2/}	7.4	8.3	8.1	8.0	8.3	8.1	9.0	9.2	9.2	8.8	8.4	8.2
Gross public saving	-0.1	-0.3	-1.0	-1.3	-1.0	-3.5	-3.8	-2.8	-2.3	-3.4	-2.4	-2.0
National saving measured by changes in wealth ^{3/}	11.6	9.7	7.4	12.8	-0.1	-3.7	10.4	1.9	13.9	10.5	5.9	...
(In percent of personal disposable income)												
Personal savings rates												
National accounts basis	6.8	6.7	8.0	7.1	7.5	6.8	5.4	6.1	4.4	4.1	3.2	4.2
Flow of funds basis	8.2	7.8	8.7	8.4	8.8	10.4	7.9	9.4	6.1	5.6	4.0	...

Sources: United States Department of Commerce, National Income and Product Accounts; and Federal Reserve Board, Flow of Funds Accounts.

^{1/} Net personal saving plus noncorporate capital consumption allowances.

^{2/} Net corporate saving plus corporate capital consumption allowances.

^{3/} The figure for each year was computed as the ratio of the change in the sum of household and government net worth to GNP. Decade averages were computed as the average of the ratios for individual years. Data were reported in Bradford (1989).

Table 2. United States: Various Measures of Net National
Saving Rates, Selected Years

(In percent of NNP) 1/

	1950	1960	1970	1980	1985
NIPA measure	11.7	8.2	6.2	7.7	4.7
Including public nonmilitary investment in fixed reproducible capital	13.2	10.6	8.2	8.5	5.5
Including public nonmilitary investment in fixed reproducible capital and consumer durables	14.6	10.9	8.8	8.7	7.0

Source: M. Boskin, M. Robinson, and A. Huber (1989).

1/ NNP has been adjusted to include the value of imputed asset
services.

Table 3. United States: Composition of National Saving

(In percent of NNP)

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80	1981-86	1951-86
Net public savings								
NIPA	-0.5	-0.2	-0.4	-0.6	-1.3	-0.9	-3.3	-1.1
Inflation adjusted	0.3	1.1	0.4	0.9	1.1	1.7	-1.7	0.4
Net private savings								
NIPA	8.1	8.3	9.0	8.9	9.3	8.3	6.7	8.3
Inflation adjusted	7.2	7.0	8.1	7.3	7.0	5.8	5.3	6.7
Net personal savings								
NIPA	5.1	5.2	5.0	5.4	6.7	5.5	4.6	5.4
Pension adjusted	4.5	4.5	4.2	4.5	5.6	3.9	3.2	4.3
Inflation adjusted	3.6	3.0	3.2	2.2	1.7	-0.6	0.5	1.8
Net corporate savings								
NIPA	3.1	3.0	3.9	3.5	2.6	2.8	2.1	3.0
Pension adjusted	3.7	3.8	4.8	4.4	3.7	4.4	3.5	4.0
Inflation adjusted	3.7	3.9	4.9	5.0	5.3	6.4	4.8	4.9

Source: Lawrence Summers and Chris Carroll (1987a).

Table 4. Personal Saving Ratios and Stock Market Capital Gains, 1980-86 ^{1/}

(As a percent of personal disposable income)

	1980	1981	1982	1983	1984	1985	1986	1987- 1986	Households' Portfolio Distribution 2/ in 1985		
									Equities	Bonds	Institutional Investment
United States									18	10	19
Personal saving	7.1	7.5	6.8	5.4	6.1	4.5	4.3	6.0			
Capital gains	15.9	-1.1	6.5	7.4	2.8	13.2	13.1	8.3			
Sum of personal saving and capital gains	23.0	6.4	13.3	12.8	8.9	17.7	17.4	14.2			
Japan									12	8	17
Personal saving	17.0	18.2	16.5	16.3	16.0	16.0	16.4	16.8			
Capital gains	0.8	1.1	0.6	4.4	3.3	1.6	10.6	3.2			
Sum of personal saving and capital gains	18.7	19.3	17.1	20.7	19.3	17.6	27.0	20.0			
Germany									6	15	17
Personal saving	14.0	14.8	13.9	12.2	12.8	12.7	13.4	13.4			
Capital gains	—	-0.3	0.3	1.1	0.4	3.2	1.3	0.9			
Sum of personal saving and capital gains	14.0	14.5	14.2	13.3	13.2	15.9	14.7	14.3			
United Kingdom									11	4	43
Personal saving	14.2	13.0	12.2	10.5	10.5	9.2	7.5	11.0			
Capital gains	6.0	0.8	4.8	6.2	6.1	3.9	6.1	4.8			
Sum of personal saving and capital gains	20.2	13.8	17.0	16.7	16.6	13.1	13.6	15.9			

Sources: IMF, World Economic Outlook, April 1988; and Bank for International Settlements, Fifty-Seventh Annual Report, June 1987.

^{1/} Capital gains include only gains on equity held directly. They exclude gains on holdings through pension funds.

^{2/} As a proportion of gross financial assets.

Table 5. Relative Income of the Elderly and Nonelderly,
Selected Years, 1950-85

Year	Ratio of Median Incomes <u>1/</u>		Ratio of Poverty Rates <u>2/</u>	Social Security Payment-Income Ratio <u>3/</u>
	Men	Women		
1950	0.35	0.49	...	0.02
1955	0.34	0.46	...	0.05
1960	0.34	0.44	1.7 <u>4/</u>	0.26
1965	0.33	0.44	2.1 <u>5/</u>	0.27
1970	0.35	0.43	2.2	0.30
1975	0.41	0.55	1.3	0.37
1980	0.42	0.67	1.2	0.40
1985	...	...	0.9	0.40

Source: Lawrence Summers and Chris Carroll (1987a).

1/ Median income of the elderly divided by median income of the nonelderly. Data for odd years are average of preceding and following even-year data.

2/ Poverty rate of the elderly divided by poverty rate of the nonelderly.

3/ Ratio of average social security payment per elderly person to per capita disposable income.

4/ Data are for 1959.

5/ Data are for 1966.

Table 6. Saving Rates and Simulation Results ^{1/}

(In percent of disposable income)

	Household Saving Rate		Change from 1970s ^{3/}	Contribution From ^{4/}			
	Actual	Baseline ^{2/}		Wealth	Inflation	Real After-Tax Interest Rates	Demographic Variables
1970-74	8.5	8.2	...	...	...	...	...
1975-79	7.5	7.8	...	...	...	...	...
1980	7.1	6.9	-1.1	-0.1	1.2	--	-0.8
1981	7.5	7.5	-0.5	-0.6	1.9	0.6	-2.2
1982	6.8	6.8	-1.2	-0.4	0.6	1.6	-2.6
1983	5.4	5.7	-2.3	-0.6	-0.8	1.7	-3.0
1984	6.1	6.2	-1.8	-0.3	-1.5	2.2	-3.2
1985	4.1	5.0	-3.0	-0.2	-1.8	2.3	-3.6
1986	4.0	4.2	-3.8	-0.5	-2.0	2.0	-4.0
1987	3.2	2.7	-5.3	-0.8	-2.1	1.6	-4.5
1988	4.2	3.5	-4.5	-0.5	-1.3	1.1	-4.6

^{1/} The simulation results employ the empirical framework developed in Section VI (page 21).

^{2/} From a simulation with all explanatory variables at actual historical values.

^{3/} Difference between the baseline simulation for the given year and the average for 1970s.

^{4/} Difference between the baseline simulation and a simulation with the given explanatory variable at its 1970s average. In the case of wealth, the wealth/income ratio is held at its 1970s average.

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