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Like virtually all developed economies, the United States is projected to experience a dramatic demographic transition over the next 50 years. By 2040 31 percent of the U.S. population will be 55 and older compared to 21 percent today (see Table 1). Most of this aging will occur among the older old with the fraction of the population over 65 predicted to almost double. While the burden on the working population of supporting dependents will be reduced somewhat due to the lower projected ratio of children to middle-aged adults, the overall dependency ratio (the ratio of those under 18 plus those 65 and older to those 18 and 64) will rise from its value of .616 in the 1980s to .730 in the 2040s.

A higher dependency ratio leads to more consumption relative to output and a lower saving rate. For the U.S., which has been experiencing a remarkably low rate of saving in the 1980s, the prospect of even lower saving rates in the future is daunting indeed. Since saving represents the increase in capital, the saving decline would spell a decline in

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TABLE 1
Population Age Distributions for the U.S. by Decade

Age group	1950s	1960s	1970s	1980s	1990s	2000s
0–17	.329	.356	.318	.268	.256	.239
18–24	.109	.114	.143	.140	.111	.110
25–34	.133	.109	.125	.156	.146	.120
35–54	.256	.240	.220	.228	.277	.299
55–64	.090	.088	.092	.092	.083	.103
65 plus	.084	.093	.102	.116	.126	.129
Age group	2010s	2020s	2030s	2040s		
0–17	.222	.216	.210	.207		
18–24	.106	.097	.097	.096		
25–34	.123	.117	.111	.113		
35–54	.269	.253	.255	.249		
55–64	.132	.128	.113	.120		
65 plus	.148	.188	.214	.215		

the capital-labor ratio were it not for the fact that the demographic transition also involves slower growth in the nation's labor supply. On balance, capital-labor ratios are likely to rise in the developed economies (see, for example, Auerbach, et al., 1989). Higher capital-labor ratios will alter factor prices by raising real wages and lowering the real return to capital. These changes in factor prices will redound to the benefit of workers in the first half of the next century, but to the detriment of contemporaneous retirees who will receive lower returns on their savings. This intergenerational "incidence" of the demographic transition will mitigate, somewhat, the increased fiscal burden expected to fall on future workers.

The size of the burden on future workers will depend, of course, on the fiscal policy response to the demographic transition. With the very significant 1983 Social Security Amendments (which raised the Social Security retirement age and made Social Security benefits taxable under the income tax) the retirement\disability portion of the Social Security payroll tax appears to be in financial balance in the long run. In contrast, the Medicare component of Social Security is slated to require additional funds or benefit cuts around the turn of the century. These projections reflect the Social Security Administration's (SSA's) intermediate actuarial assumptions. According to the SSA's pessimistic projections, the combined retirement\disability and Medicare programs will be in significant financial trouble by 2020. Even the pessimistic projections assume the accumulation of a substantial Social Security trust fund over

the next two decades which will help pay for the retirement benefits of the baby boom generation. If the federal government responds to the near-term Social Security receipts by reducing payroll or other taxes, as is now being done implicitly by including Social Security surpluses in meeting the Gramm-Rudman-Hollings deficit targets, the result will be even larger burdens on the children and grandchildren of the baby boomers.

A related concern about fiscal policy has to do with the growing political power of the elderly. While the elderly, defined here as those 55 and older, currently represent one-fifth of the voting age population, they will represent almost a third of potential voters by 2020. In exercising their increased political power, the elderly may seek additional transfers from the government, which ultimately means from young and future generations, or, what amounts to the same thing, the elderly may seek to reduce their tax obligations to the government. A recent example of this process is the dispute over the Medicare surcharge introduced in 1988 (and repealed in 1989) to pay for the catastrophic health care for the elderly.

Since the elderly, as a group, appear to consume a greater fraction of their wealth annually than the young (Abel, Bernheim, and Kotlikoff, 1989) and, certainly, than unborn generations, additional redistribution toward the elderly will mean additional downward pressure on the U.S. saving rate.

This paper focuses on U.S. saving, demographics, and fiscal policy. It addresses the following questions: first, what has been the pattern of postwar U.S. saving rates—specifically, have saving rates declined in the 1980s and by how much? Second, is the apparent drop in the saving rate dependent on how one defines saving? Third, is demographic change responsible for low U.S. saving in the 1980s? If not, what is? Fourth, how are the projected demographic changes over the next 50 years likely to affect saving rates during this period? Fifth, since the time path of saving rates is critical to the time path of current account deficits in an open economy such as the U.S., how will the demographic transition influence future current accounts? Sixth, how do fiscal policy and demographics interact in affecting saving, i.e., how much more detrimental to saving are policies that redistribute toward the elderly if they occur at a time when the population is quite aged?

The next section of this paper describes recent U.S. saving behavior, pointing out that saving has declined in the 1980s according to a variety of alternative measures of saving and income. Section II uses data from the Consumer Expenditure Surveys of the 1980s to consider how demographics may affect saving rates. The analysis uses the age-

consumption, age-earnings, and age-capital income profiles observed in these data and asks how saving rates in the past as well as the future would have looked and would look were these profiles time-invariant. This experiment asks, then, how saving rates respond to changes in the age distribution of the population holding all else constant. The analysis leads to a prediction of higher saving rates in the 1990s, but steadily declining rates of saving thereafter. The results also suggest, rather strongly, that demographics *cannot* explain the low rate of U.S. saving in the 1990s, nor, indeed, the postwar pattern of U.S. saving.

Section III considers the interaction of future fiscal policies and demographics with respect to future U.S. saving. We show that changes in the age distribution of the population are likely to have only minor effects on government consumption and U.S. saving given the current pattern of government consumption expenditures by age. In contrast, intergenerational shifts in the burden of fiscal policy may shift the age-distribution of private consumption and have important effects on future saving rates, with these effects accentuated by the aging of the population.

Section IV turns to the question of future current account deficits. The analysis here is partial equilibrium in nature in the sense that the world interest rate is taken as given. Still, the results seem interesting. Our calculations lead to the prediction of positive, but declining current accounts (surpluses) over the next 50 years. Section V returns to the question of saving in the 1980s, discussing other explanations for its decline. Section VI summarizes and concludes the paper by pointing out that our approach toward understanding the effects of demographic change on saving is only one of many that could and should be considered.

I. RECENT SAVING BEHAVIOR IN THE UNITED STATES

A meaningful discussion of the level and determinants of the U.S. saving rate requires care in defining saving. In general terms, saving equals income less consumption, but one must resolve various ambiguities concerning the measurement of income and consumption. There are a number of different measures of aggregate saving, some of which bear little relationship to an economist's notion of saving. In this section of the paper, we review and evaluate the alternative measures commonly used and discuss their performance during the past decade. This will provide a clearer picture of the recent decline in the U.S. saving rate. Our analysis indicates that while the rate of saving may depend heavily

on one's definition, measurement issues alone do not alter the conclusion that the rate of U.S. saving declined significantly during the 1980s.

Before discussing these findings, it will be useful to review some national income definitions and accounting identities. Because we are interested in net additions to national wealth, we begin with the aggregate income measure that excludes depreciation from Gross National Product (*GNP*), the Net National Product (*NNP*). Other income measures include Disposable National Income (*DNI*), equal to *NNP* plus government transfers (*R*) less taxes paid (*T*):

$$DNI = NNP - T + R \tag{1}$$

and Disposable Personal Income (*DPI*), equal to disposable national income less undistributed corporate profits, usually referred to as business saving:

$$DPI = DNI - BS. \tag{2}$$

Each of these measures of income, *NNP*, *DNI*, and *DPI*, is commonly used as a base for measuring saving. (Note that, according to government accounting procedure, transfers *R* include interest payments on the national debt to U.S. households and businesses.)

In addition to different measures of income, alternative saving measures are based on different notions of consumption. The most basic measure is household consumer expenditures from the national income accounts, *C*. The broader measure would include government expenditures, *G*. To correct for the fact that some household expenditures on consumer durables really represent investment, and that, likewise, some government spending should really be categorized as investment (there is no official government capital account) one can adjust these measures by subtracting the investment component of current expenditures, *CI*, and adding back in the imputed rent on such expenditures, *GIR*.

$$CC = C - CI + CIR \tag{3}$$

$$GC = G - GI + GIR. \tag{4}$$

Making these corrections also alters the corresponding measure of aggregate income. Aggregate investment spending rises by $CI + GI$, exceeding the decline in measured consumption by $CIR + GIR$. To

TABLE 2
Postwar Saving Rates in the United States

Years	Personal (HSR)	Private (PSR)	National (NSR)	National, corrected
1950–1959	6.8	10.4	9.2	13.3
1960–1969	6.7	11.2	8.9	13.0
1970–1979	8.0	11.1	8.5	11.8
1980	7.1	8.9	6.8	8.4
1981	7.5	9.3	7.4	8.9
1982	6.8	7.6	3.2	4.7
1983	5.4	7.8	3.3	5.5
1984	6.1	9.3	5.7	8.6
1985	4.4	7.8	3.6	7.1
1986	4.0	7.2	2.8	na
1987	3.2	5.6	2.7	na
1988	4.2	6.3	3.8	na

na: not available

Sources: 1950–1987: Economic Report of the President, 1989; 1988: Survey of Current Business, June 1989

Imputed rent on an asset is calculated as annual depreciation plus 3 percent times the stock of the asset. Annual depreciation of consumer durables and government non-military tangible assets as well as the stocks of consumer durables and government tangible assets are reported in the U.S. Dept. of Commerce's *Fixed Reproducible Tangible Wealth in the United States, 1925–1985*.

maintain the consistency of the national income identity that net national product equals consumption plus net investment plus government spending plus net exports, one must therefore add the imputed rent on consumer and government capital to net national product:[1]

$$NNPC = NNP + CIR + GIR. \tag{5}$$

With these definitions of income and consumption, we now discuss recent trends in U.S. saving behavior. Table 2 provides annual values of several different measures of saving over the past decade. The first

[1] The corrected net national product measure adjusts the National Income Accounts measure of net national product by 1) adding the imputed rent on consumer durables and government tangible assets, excluding military equipment (expenditure on which is treated as current consumption) and 2) subtracting the depreciation on the stock of consumer durables and government tangible assets (excluding military equipment). Corrected private consumption measure equals private consumption expenditure on goods and services plus the imputed rent on consumer durables. Corrected government consumption equals the National Income Account measure of government consumption less government expenditures on (non-military) equipment and structures, plus the imputed rent on government equipment (non-military) and structures.

column presents the personal saving rate, perhaps the most commonly cited measure of saving. This is the fraction of disposable income that households save.

$$HSR = (DPI - C)/DPI = HS/DPI. \tag{6}$$

It averaged 6.8 percent during the 1950s, 6.7 percent during the 1960s, and 8.0 percent in the 1970s. Annual values for the period 1980–1982 fall among these averages. Since then the personal saving rate has fallen considerably, averaging less than 4 percent during the period 1985–1988. While the personal saving rate has risen slightly in 1988, it is still well below the averages of previous decades.

Though popular, the personal saving rate has several shortcomings that raise questions about its usefulness. First, a significant fraction of saving has traditionally been done by business, so looking only at personal saving may provide a misleading picture of the overall saving rate. Second, empirical research (David and Scadding, 1974 and, more recently, Auerbach and Hassett, 1989) has suggested that personal and business saving are closely related, that personal saving decisions respond to those of business and cannot be understood in isolation. Third, the accounting conventions used to define personal income and saving are necessarily arbitrary. For example, though they are essentially equivalent transactions, the payment of dividends reduces business saving and increases personal disposable income and saving, while a redemption of corporate shares does neither. A rise in nominal interest payments by corporations to households caused by an increase in the inflation rate also increases measured household income and saving at the expense of corporate saving, without anything real having happened. Since the 1980s has been a period during which the inflation rate and the mix of dividends and share repurchases among corporate distributions has changed significantly, these accounting conventions may distort one's inferences about recent saving.

Moving to the private saving measure, which includes household and business saving, eliminates these problems. Such a measure is given in the second column of Table 2. This private saving rate,

$$\begin{aligned} PSR &= (DPI + BS - C)/(DPI + BS) = (DNI - C)/DNI = PS/DNI \\ &= (HS + BS)/DNI = (NNP - T + R - C)/(NNP - T + R) \end{aligned} \tag{7}$$

is essentially equal to the fraction of private sector disposal income not consumed by households. It is higher than the personal saving rate but

shows the same drop in the 1980s. The private saving rate is more indicative of the rate of household wealth accumulation than the personal saving rate because households own businesses. If businesses accumulate assets, these assets belong to households, and should therefore be included in our measure of saving. A similar argument may be made with respect to government saving. Accumulations of assets by the government increase national wealth, just as private accumulations do. While the rights to such accumulations may be less easily assigned to any one group of households, they certainly represent additions to the wealth of the population (current and future) as a whole, since the population controls (owns) the government. Like the personal-private saving distinction, the distinction between government and private saving is, according to much of economic theory, entirely arbitrary. For example, a decision by the government to call Social Security contributions "loans to the government," rather than "taxes," and Social Security benefits, "repayment of these loans," rather than "government transfer payments" would dramatically alter the reported values of private and government saving, but should not alter the sum of government plus private saving. As before, this point argues for a broader measure of saving including public as well as private accumulations. Such a measure, defined by

$$\begin{aligned} NSR &= (DNI + T - R - C - G)/(DNI + T - R) \\ &= (NNP - C - G)/NNP \end{aligned} \tag{8}$$

is given in the third column of Table 2. This national saving rate equals the fraction of net national product not devoted either to consumption or government spending.

Like the personal and private saving rates, the national saving rate declined during the 1980s. However, the drop was more precipitous, with the national saving rate averaging just 3.2 percent during the period 1985–1988.

A final measure of national saving incorporates the corrections for household and government investment discussed above:

$$NSRC = (NNPC - CC - GC)/NNPC = NSC/NNPC \tag{9}$$

This measure, given in the fourth column of Table 2, in general shows much higher levels of national saving than the uncorrected measure in column 3. This indicates that a considerable amount of national saving occurs through the usually ignored channels of household and govern-

ment purchases of capital goods. However, the correction further accentuates the decline in national saving in the 1980s. While the average uncorrected national saving rate in the 1980s was 3.5 percentage points lower than in the 1970s, the average corrected measure fell by 4.6 percentage points.

In summary, the measures of the U.S. saving rate presented in this section vary considerably in their estimates of the fraction of income saved in the 1980s. However, all measures of the saving rate indicate a very clear decline during the 1980s.

II. DEMOGRAPHICS AND SAVING RATES

Several researchers have remarked about the relative stability of the shape of U.S. cross section age-consumption and age-earnings profiles in the postwar period (Kotlikoff and Summers, 1981, and Carroll and Summers, 1989). The stability of these profiles suggests asking what saving rates would be in the future if these profiles retain their shapes and current levels; i.e., suppose consumption, earnings, and capital income at each age as well as the age-pattern of government consumption expenditure stayed the same, how would saving rates evolve over time as the age distribution of the population changes? The methodology underlying this exercise is described in detail in the Appendix. The population data used in this analysis come from the Social Security Administration and represent historical figures and projections based on intermediate assumptions. The relative age-sex consumption, earnings, and capital income profiles were derived from data based on the 1980 through 1985 Consumer Expenditure Surveys (*CES*) of the U.S. Bureau of Labor Statistics.[2] The method used to determine the age-pattern of

[2] For the consumption profile, the procedure began with an allocation of total consumption reported by *CES* households to members within the household. Some of the household consumption expenditures, such as a child's clothing, could be allocated more accurately than general expenditures, such as food. Such general expenditures were divided evenly among adults (individuals over 18) and children, but under the assumption that each child's consumption of general expenditures is one-third of that of an adult. The resulting data, which consisted of individual consumptions indexed by age and sex, were next used to form the weighted (based on *CES* population weights) average value of average consumption by age and sex for the quarter in question. These values were then divided by the corresponding quarter's weighted average of consumption of 40-year-old males. The resulting relative consumptions indexed by age, sex, and quarter were then regressed against fifth-order polynomials interacted with sex dummies. The predicted values for this regression provide the values of the $R^c_{a,m,t}$'s and the $R^c_{a,f,t}$'s. The method of deriving the values of the $R^e_{a,m,t}$'s and the $R^e_{a,f,t}$'s is essentially the same except for the fact that reported earnings are annual and there is no problem of allocating earnings to the correct individual. The same general method is also used to derive the $R^k_{a,m,t}$'s and the $R^k_{a,f,t}$'s profiles. However, rather than using reported capital income which is likely to

TABLE 3
The Effect of Demographics on Saving Rates for Fixed Age-Earnings, Age-Consumption, and Age-Government Consumption Profiles

Decade	*Predicted saving rates Base year* 1987	1980	1970	1960	1950	Actual U.S. saving rates
1950–1959	.013	.090	.128	.110	.117	.092
1960–1969	−.041	.042	.082	.064	.074	.089
1970–1979	−.037	.045	.084	.066	.075	.085
1980–1989	.014	.090	.128	.109	.115	.044*
1990–1999	.053	.125	.160	.142	.147	
2000–2009	.068	.139	.173	.156	.161	
2010–2019	.065	.137	.170	.154	.160	
2020–2029	.045	.119	.151	.136	.146	
2030–2039	.030	.105	.136	.122	.133	
2040–2049	.026	.101	.132	.118	.129	

* This average is over the period 1980–1988.

government consumption expenditure is described in Auerbach, et al. (1989).

Table 3 reports the average decade saving rates that are predicted based on equation (1) for five different base years: 1950, 1960, 1970, 1980, and 1987. There are several striking features of this table. First, for each of the base years the saving rate is predicted to rise over the course of the next three decades and then decline somewhat over the following three decades. Taking 1987 as the base year, the predicted saving rate in the 1980s is 1.4 percent; it is 5.3 percent in the 1990s, rises to 6.5 percent in the period 2010–2019, and then declines to 2.6 percent in the 2040s. The predicted pattern of saving rates reflects the aging of the population coupled with the fact that the difference between average (over males and females) earnings and average consumption at a given age is, in the case of the 1987 base year, negative for ages 20 and below, positive between ages 20 and 58, and negative after age 58. Figure 1 plots the difference between average age-earnings and age-consumption profiles for the base year 1980. The corresponding figure for other base years is quite similar. Figure 1 can be compared with Figure 2 which plots the age distribution of the population for a select set of years.

greatly understate true capital income, we used the CES asset data to form annual observations of weighted average net worth by age and sex. Net worth is the sum of financial assets, such as stocks, bonds, and checking accounts, and real estate, less mortgages and other liabilities. A description of the net worth calculation is provided in Abel, Bernheim, and Kotlikoff (1989).

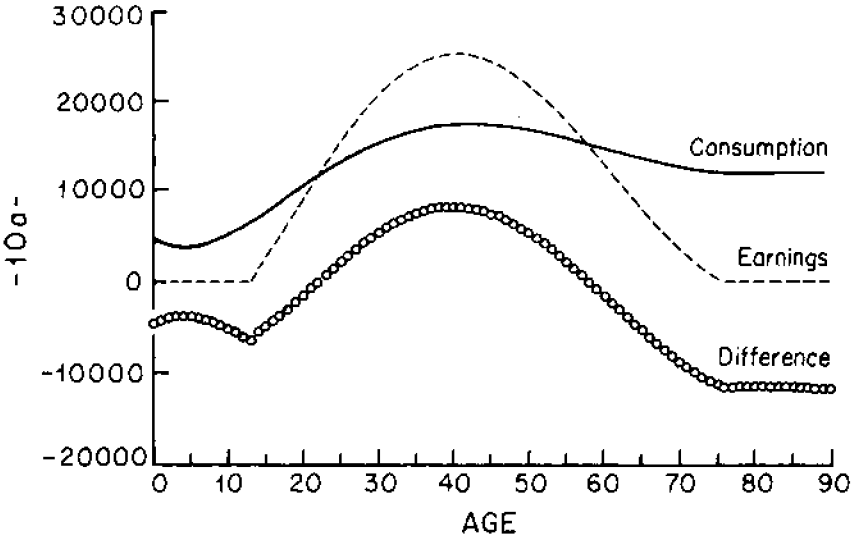

FIGURE 1. *Average Age–Earnings, Average Age–Consumption, and the Difference*

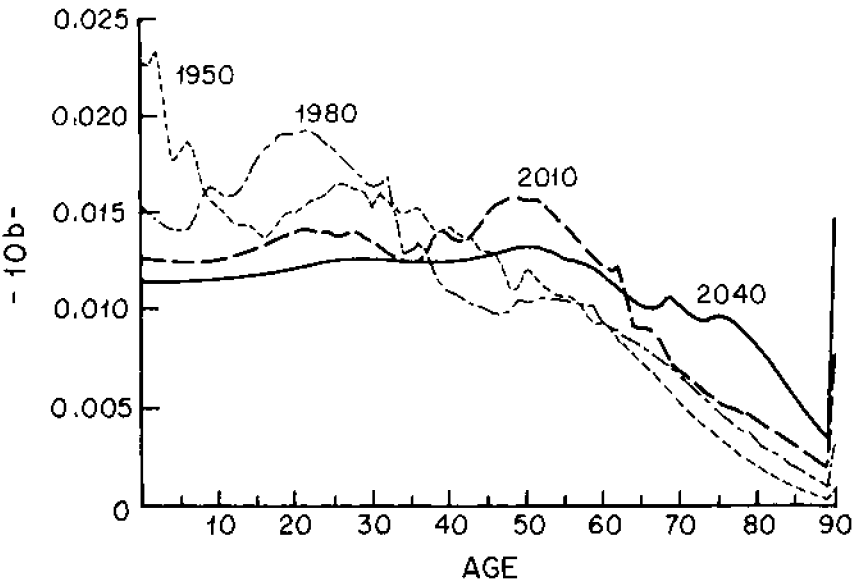

FIGURE 2. *Share of Total Population at Particular Age*

A second important feature of the table is that the predicted pattern of saving rates in this decade and the previous three decades do not match up very well with the observed pattern of saving rates. From demographics alone one would have predicted high saving rates in the 1950s and 1980s and low saving rates in the 1960s and 1970s. Clearly, much more than demographics appears to be at play in the data. Further research is needed to determine the precise explanation for the failure of Table 2's predicted time pattern of saving rates to match the actual postwar pattern.[3] Still, the table suggests that demographic change can, itself, have very powerful effects on national saving rates.

III. FUTURE SAVING RATES AND THE INTERACTION OF FISCAL POLICY AND DEMOGRAPHICS

The saving rate simulations of Table 3 implicitly hold constant fiscal policy. This section considers how possible changes in government consumption and intergenerational policy affect the predicted saving rates. We consider first the question of government consumption spending, holding fixed the age-consumption, age-earnings, and age-capital income profiles. With these household profiles held fixed, Table 4 asks how the predicted national saving rates would be affected by a change in our assumption about the response of government spending to demographic shifts.

The calculations reported in Table 3 assumed a constant age-specific pattern of government consumption spending. Table 4 presents simulations based on the alternative assumption that government consumption per capita remains fixed through time at the various base year values. That is, we hold constant government spending per capita rather than government spending per member of particular age groups. Under our previous assumption, increases in per capita spending would automatically have been predicted by a shift (from the base year) in the share of the population accounted for by those groups, such as the elderly, who individually receive substantial levels of government services.

A comparison of Tables 3 and 4 shows that assuming fixed per capita government consumption expenditures leads to only slightly lower predicted saving rates over the next 50 years. At least one reason for this is that the increases in per capita government spending anticipated in the

[3] A better fit does not arise from assuming that the ratio of child to adult consumption of general consumption expenditures (those that cannot be identified in the *CES* data as child- or adult-specific) is one-half rather than one-third.

TABLE 4
The Effect of Demographics on Saving Rates for Fixed Age-Earnings and Age-Consumption Profiles and Fixed Per Capita Government Consumption

Decade	*Predicted saving rates Base year* 1987	1980	1970	1960	1950	Actual U.S. saving rates
1950–1959	.016	.088	.123	.107	.118	.092
1960–1969	−.031	.045	.081	.066	.080	.089
1970–1979	−.029	.042	.083	.068	.081	.085
1980–1989	.016	.088	.123	.107	.117	.044*
1990–1999	.050	.120	.154	.138	.147	
2000–2009	.063	.132	.165	.151	.161	
2010–2019	.059	.130	.162	.149	.150	
2020–2029	.043	.115	.147	.136	.140	
2030–2039	.030	.130	.136	.124	.140	
2040–2049	.025	.099	.131	.120	.136	

* This average is over the period 1980–1988.

simulations reported in Table 3 are not that significant. Although the elderly receive a disproportionate share of government spending, so do the young (primarily on education). As the population ages, the decline in spending on the young partially offsets the increase in spending on the old in the simulations reported in Table 3.

Table 5 considers a related, but more extreme policy change. Suppose that all funds spent on age-specific government items in the base year had been directed toward the elderly, and that the level of this spending per elderly person were kept fixed even as the fraction of elderly in the population increased over time. This experiment reflects the potential shift in government spending that would result were the elderly able to redirect all age-specific spending toward themselves and maintain such spending levels over time; it surely represents the largest plausible estimate of the possible impact of population aging on government spending.

Since the predicted saving rates in Table 5 incorporate this very strong assumption, comparing Table 5 with Table 3 indicates the maximum saving effect likely to arise if the elderly, because of increased political influence, were able to redirect all of the age-related government consumption expenditure (which excludes defense, etc.) to spending on themselves. Indeed, such an outcome would have a significant impact on national saving. As the population ages, a large increase in govern-

TABLE 5
The Effect of Demographics on Saving Rates When All Age-Related Government Consumption Expenditures Are All Spent on the Elderly

Decade	*Predicted saving rates* Base year 1987	1980	1970	1960	1950	Actual U.S. saving rates
1950–1959	.046	.110	.135	.113	.114	.092
1960–1969	−.007	.060	.084	.063	.068	.089
1970–1979	−.013	.054	.077	.056	.062	.085
1980–1989	.019	.083	.105	.083	.089	.044*
1990–1999	.045	.107	.127	.106	.112	
2000–2009	.056	.118	.137	.117	.125	
2010–2019	.037	.101	.117	.099	.111	
2020–2029	−.012	.055	.065	.049	.070	
2030–2039	−.047	.022	.029	.012	.040	
2040–2049	−.053	.016	.022	.007	.034	

* This average is over the period 1980–1988.

ment spending per capita would occur under the assumptions used to produce Table 5. This leads to a significant fall in predicted saving rates after the turn of the century. For example, using 1980 as the base year, we find that the predicted national saving rate for the decade beginning in 2020 falls from 11.9 percent in Table 3 to 5.5 percent in Table 5.

In addition to changes in government consumption, a second important dimension of fiscal policy that can affect saving is the government's intergenerational policy, by which we mean the extent to which the government places the burden of paying for its consumption on different age groups. If the growing political power of the elderly leads to reduced taxes on the elderly and more transfers to them, this should have the effect of rotating the age-consumption profile toward more consumption by the elderly and less consumption by the young. Table 6 considers the effects of such a rotation on the predicted saving rates. Specifically, we adjust the benchmark profile of consumption by age (keeping base year consumption constant) by increasing the relative consumption of those over 65 relative by 5 percent and reducing the relative consumption of those under age 45 by 5 percent. Roughly speaking, one may view this as simulating the effect of cutting taxes on the elderly by 5 percent of income and raising taxes on the young by 5 percent of income.

As a comparison of Tables 3 and 6 indicates, altering the age-consumption profile in this manner leads to somewhat higher predicted

TABLE 6
The Effect of Demographics on Saving Rates When the Age-Consumption Profile is Rotated in Favor of the Elderly

Decade	*Predicted saving rates Base year* 1987	1980	1970	1960	1950	Actual U.S. saving rates
1950–1959	.013	.091	.129	.091	.116	.094
1960–1969	−.041	.042	.082	.044	.073	.089
1970–1979	−.038	.044	.084	.046	.113	.085
1980–1989	.014	.090	.128	.090	.144	.044*
1990–1999	.052	.124	.160	.124	.156	
2000–2009	.065	.136	.171	.138	.154	
2010–2019	.059	.132	.165	.135	.137	
2020–2029	.038	.112	.144	.117	.123	
2030–2039	.021	.097	.128	.103	.119	
2040–2049	.016	.092	.124	.099	.136	

* This average is over the period 1980–1988.

saving rates from now through 2030 and lower saving rates thereafter. For example, in Table 3 the 1987 base case predicted saving rates for the 2010s and 2040s are .065 and .026 respectively; the corresponding Table 6 values are .059 and .016.

IV. THE DEMOGRAPHIC TRANSITION AND FUTURE CURRENT ACCOUNTS

Given the openness of the U.S. economy, the significant saving rate changes predicted by the simulations presented in Tables 3–6 imply potentially large international capital flows and movements in the U.S. current account. The current account is a closely-watched measure in the area of international trade and competitiveness.

The current account surplus equals the difference between the accumulation of assets by Americans (including the government) and investment in the United States by Americans and foreigners. This difference, referred to as net foreign investment, indicates, if it is positive, that Americans are, on balance, saving enough to finance not only all investment in the United States, but also some investment abroad. If, on the other hand, net foreign investment is negative, saving by Americans is insufficient to finance all current investment in the United States and some current U.S. investment must be financed by foreigners. The implication of running current account deficits (having negative net

foreign investment) is, therefore, that more of the capital at work in America will be owned by foreigners. Concern about foreigners buying up American capital has heightened in the 1980s as the nation ran quite substantial current account deficits when measured relative to net national product.

The demographic transition is likely to affect significantly future U.S. current account deficits both by altering U.S. saving and, therefore, the accumulation of assets by Americans and by altering the amount of investment in the United States. In the presence of significant international capital mobility, U.S. investment is determined, at the margin, not by the amount of U.S. saving, but rather by the international capital market. Given the rate of return that can be earned by investing abroad, investment will take place domestically up to the point that the return to capital in the United States equals the internationally determined rate of return. The domestic rate of return to investment will depend on the ratio of capital to labor. Hence, it is this capital-labor ratio that will adjust until the return to investment at home equals the return to investment elsewhere in the world. Given the supply of U.S. labor, which is determined in large part by demographics, investment (changes in capital) will occur up to the point that the U.S. capital-labor ratio is such as to yield the internationally determined rate of return. Thus demographics, by affecting the supply of labor, influences the amount of U.S. investment as well as U.S. saving. Since the current account deficit is the difference between U.S. investment and U.S. saving, demographics influences the current account as well.

Section II demonstrated that the demographic transition is likely, over time, to lower the rate of U.S. saving. Since the growth rate of U.S. labor supply will also decline, demographics will also lower the rate of U.S. investment (measured relative to *NNP*). The question is whether demographics will reduce saving by more than it reduces investment.

Table 7 presents the predicted values of the current account deficits for the next six decades divided by predicted net national product. The first three columns of the table provide estimates based on the assumption of constant world interest rates of 10, 7.5, and 5 percent, respectively. Each of these columns shows large predicted current account surpluses throughout the period, reversing the experience of current account deficits in the 1980s. The trend is toward improvement in the current account surpluses over the next 30 years and a gradual deterioration thereafter.

Such simulations may overstate the likely current account surpluses, because they ignore the demographic shifts that will be occurring simul-

TABLE 7
Predicted Current Account Surpluses Relative to Predicted Net National Product

	World interest rate					
	Constant			*Gradual decline*		
Decade	.10	.075	.05	.10	.075	.05
1990–1999	.027	.025	.023	.025	.023	.021
2000–2009	.052	.050	.049	.050	.048	.047
2010–2019	.062	.062	.062	.061	.061	.060
2020–2029	.047	.047	.047	.045	.045	.045
2030–2039	.030	.029	.029	.028	.028	.027
2040–2049	.025	.025	.025	.024	.023	.023

taneously in other countries. Many of the mature Western economies will also experience population aging and associated increases in saving rates. Together, these increases in saving worldwide can be expected to depress world interest rates and reduce the outflow of funds from the United States. To consider this issue, we repeat the current account calculations just presented, this time assuming that the world interest rate falls gradually by 3 percentage points between 1990 and 2050 from the value initially assumed for the simulation. However, even such a significant drop in world interest rates only slightly diminishes the predicted surpluses over the period.

V. ALTERNATIVE EXPLANATIONS FOR THE RECENT DECLINE IN U.S. SAVING

While the demographic factors discussed in the previous sections may help predict the behavior of saving in the future, and may have contributed to the determination of saving in the past, they clearly cannot explain the behavior of saving in the 1980s. If our characterizations of the impact of demographics is correct, then there must have been other, major determinants of the rate of saving that pushed in the opposite direction during the 1980s, to offset the rise (relative to the '60s and '70s) in saving one would have predicted on the basis of demographic factors alone. This section of the paper briefly considers several alternative explanations that have been proposed for the decline in saving during the 1980s.

Government Consumption

One potential explanation for low U.S. saving in the 1980s that can be dismissed is that increased government consumption is to blame. Table 8 presents the ratio of government consumption to net national product based on both the corrected and uncorrected data. The corrected data indicate that the ratio of total government (federal, state, and local) consumption to *NNP* was only 0.5 percent higher (22.5 percent versus 22.0 percent) during the first half of the 1980s than it was during the period 1950 through 1979.

To measure the contribution of this small increase in the share of government spending out of *NNP* to the observed decline in the national saving rate, it is useful to consider the impact on national saving had the ratio of private consumption, *C*, to the fraction of output *not* absorbed by the government, $NNP - G$, remained the same. That is, we may define a saving rate out of private sector resources, which we shall, for convenience, call the *non-government* saving rate (*NGSR*),

$$NGSR = (NNP - G - C)/(NNP - G), \tag{10}$$

and consider the impact of the increase in *G/NNP* holding this saving rate constant. This saving rate differs from the private saving rate defined above if the government's budget deficit, equal to government spending plus transfers less taxes, $G + R - T$, is not zero (see equation 7).

The non-government saving rate seems to be the appropriate measure of private saving to consider in thinking about changes in government consumption assuming 1) that government consumption is not a close substitute for private consumption and 2) that changes in government

TABLE 8
Net National and Non-Government Saving Rates, Corrected and Uncorrected

	Corrected measures			*Uncorrected measures*		
Period	National saving rate	Non-government saving rate	*G/Y*	National saving rate	Non-government saving rate	*G/Y*
1950–1959	.133	.167	.203	.092	.116	.211
1960–1969	.130	.166	.215	.089	.116	.226
1970–1979	.118	.152	.223	.085	.109	.222
1980–1985	.072	.093	.230	.050	.064	.223
1980–1988	na	na	na	.044	.057	.225

na: not available

consumption are not associated with changes in the intergenerational distribution of the burden of paying for government consumption.

Under these assumptions one would not expect a change in the fraction of output absorbed by government spending to affect the rate of private consumption out of national output left over after government consumption ($NNP - G$). If, instead, government consumption were a close substitute for private consumption, increases in government consumption would likely be offset by decreases in private consumption, leaving a smaller total impact on national consumption and saving. By making the first assumption, that the non-government saving rate is fixed, we are, therefore, biasing our analysis toward a larger impact of government consumption expenditure on national saving.

Changes in the intergenerational distribution of the burden of paying for government consumption that accompany changes in government consumption represent another reason that the nongovernment saving rate might change with changes in government consumption. We have discussed above the impact that such intergenerational changes might have on future saving, and will consider them again below. However, making the second assumption, and thereby ignoring the effects of such changes in the intergenerational distribution of the fiscal burden, seems most appropriate for discerning the effect of increased government consumption, per se, on total national saving.

It is easy to see that the small rise in the ratio of government saving to *NNP* could not, in itself, have had a very large impact on the national saving rate. Using the definitions of the national saving rate (*NSR*) given in expression (8) and the non-government saving rate (*NGSR*) given in expression (10), we have the relation

$$NSR = NGSR \times [1 - (G/NNP)]. \tag{11}$$

Expression (11) shows that a one percentage point increase in the ratio of *G* to *NNP*, holding the non-government saving rate constant, would reduce the national saving rate by only *NGSR*, or roughly 0.1 percent. Had the non-government saving rate remained constant in the 1980s at its average level for the period 1950–1979, the rise in government consumption to *NNP* in the 1980s would have reduced the uncorrected national saving rate for the 1980s from .089 (the average rate observed during the period 1950 through 1979) to .088. Hence, the non-government saving rate must also have declined substantially during the 1980s for national saving to have declined as it did. Table 8 presents corrected and uncorrected measures of the non-government saving rate, also repeating for convenience the national saving rates given in Table 2.

Regardless of whether one corrects the basic data for consumer durables and government investment, the non-government saving rate has fallen dramatically in the 1980s. According to the corrected data, it averaged 16.2 percent over the period 1950 through 1979, but only 9.3 percent from 1980 through 1985.

Deficits and Intergenerational Fiscal Policy

While the government did not consume much more of *NNP* in the 1980s than in the previous three decades, many content that the government, by running large deficits, shifted the burden of paying for government consumption from current to future generations. Such a generational policy, the argument goes, should induce a spending spree by current generations in response to their reduced tax bill. As an explanation for the observed decline in saving, however, this view encounters several problems.

The first problem concerns the measurement of the deficit itself. While there is no doubt that the official government deficit rose more rapidly in this decade than in any recent peacetime period, there is reason to doubt that the government's generational policy was, on balance, as redistributive to current generations as is commonly believed. A closer look at intergenerational policy shows that a good deal of what the federal government gave current generations with its right hand during the 1980s, it took away with its left. For example, the 1983 Social Security amendments reduced the future benefits of current young and middle age generations by an amount, in present value, roughly equal to their gain from the income tax cuts. If current young and middle age generations understand this change and expect it to be sustained in the future, they should view this loss in future income as requiring them to consume less now and save more for their old age.

Even if one doubts that most individuals make the kind of rational, present value calculations necessary to "see through" reported budget deficits to the underlying effects of current and expected future fiscal policies, there are other reasons to doubt that the deficit is to blame for our low rate of national saving.

The strongest case for deficits leading to reduced national saving can be made from a Keynesian perspective. The Keynesian argument goes like this: households base their consumption decisions on current disposable income; since the household saving rate is very close to zero, increases in disposable income associated with increases in government transfers or decreases in taxes will increase consumption nearly dollar for dollar, thereby reducing national saving considerably.

One problem with the Keynesian approach is that it does not provide a strong justification for the assumption that consumption is based primarily on current disposable income. One possible argument for such an assumption is that American households are liquidity constrained, which in everyday language means they have few liquid assets and consume everything they can get their hands on. Hence, if the government takes less from them in the form of taxes, they will consume today every dollar that would otherwise have gone to taxes. However, essentially every study of liquidity constraints has demonstrated that, at most, 20 percent of American households are liquidity constrained. Such liquidity-constrained households probably account for, at most, 10 percent of total U.S. consumption.

A second reason to doubt the importance of liquidity constraints is that the growth of consumption expenditures, at least in the last five years, has not been limited to non-durables and services, as one would expect if liquidity-constrained households were the cause of the increased consumption spending. (They would not choose to provide for future consumption by purchasing durables). The average over the last five years of the annual share of total expenditures accounted for by durables is slightly higher than it was in the period 1950 through 1979.

A third reason why the liquidity constraint argument doesn't square with the facts has to do with the composition of the reported deficit. Interest payments comprised much of the federal deficits in the 1980s. For example, in 1985, $130 billion of the $196 billion federal deficit represented interest payments. Since liquidity-constrained households obviously aren't bond holders, the key variable to consider for such households is how the difference between taxes and transfers (excluding interest payments) changed in the 1980s compared to the earlier period. And one should consider not simply how federal taxes less transfers have changed, but how this difference has changed for all governments combined. For all governments (federal, state, and local), the ratio of taxes plus transfers to *NNP* averaged .220 between 1980 and 1987. It averaged .226 for the 1970s, .239 for the 1960s, and .224 for the 1950s. Hence, the share of taxes less transfers to *NNP* was only slightly lower in this decade than in the previous three decades. In considering these figures it is also worth noting that the very slight decline in the 1980s in the ratio of net taxes to *NNP* primarily reflects a decline in corporate taxation (which should not affect liquidity-constrained households). In the 1980s corporate taxes represented only 8.1 percent of total government taxes. In comparison, they represented 15.2 percent of total taxes in the 1960s.

Finally, even if one ignores the problems with the liquidity constraint argument (that would suggest omitting the interest component of the deficit) and adopts the Keynesian assumption of a high marginal propensity to consume additions to disposable income caused by budget deficits, this still fails to explain the extent of the observed decline in the national saving rate. To see that this is so, it is useful to note that the national saving rate (*NSR*) as defined in (8) is related to the deficit, $D\ (= G + R - T)$ and the private saving rate (*PSR*) defined in expression (7) by the following identity:

$$NSR = PSR \times [1 - (G/NNP)] - (1 - PSR) \times (D/NNP). \quad (12)$$

Given the near constancy of the ratio of government consumption to *NNP* over the past several decades, one can conclude that, holding the private saving rate fixed, a one percentage point increase in the deficit-net national product ratio would decrease the national saving rate by $1 - PSR$, or about 0.9 percent. Given the increase of 2.7 percent in the deficit ratio during the 1980s over its average for the period 1950–1979, had the private saving rate remained constant at its 1950–1979 average of 10.9 percent, the national saving rate should have declined by about 2.4 percent during the 1980s. In fact, the national saving rate fell by much more, about 4.5 percent, from the period 1950–1979 to the 1980s.

This greater decline in saving is evident from the sharp declines in the personal and private saving rates during the 1980s, already shown in Table 2. Even if deficits relative to *NNP* had not increased in recent years, this pattern of private saving rates would have led to substantial declines in national saving.

To summarize, even under the most extreme Keynesian view of deficits, one that has a weak theoretical justification, one can attribute only part of the recent decline in national saving to government budget deficits. Under more realistic views of the Keynesian model or other, more plausible, theories of consumption, notably the Life-Cycle model, one would expect deficits to have much smaller effects on saving, since households would be predicted to consume only a small fraction of the increase in current disposable income provided by the tax cuts (Auerbach and Kotlikoff, 1987; Poterba and Summers, 1988).

Saving Disincentives

It is hard to argue that saving disincentives are responsible for the decline in saving in this decade since in the first half of this decade the federal government reduced many saving disincentives. Foremost among these was the steady reduction in marginal tax rates on house-

hold capital income, from a top rate of 70 percent in 1980 to 33 percent in 1988.

Some of the policies used to promote savings, such as the IRAs, were, unfortunately, poorly designed to produce new saving and quite possibly reduced rather than increased saving. Others, such as the move toward a consumption-oriented tax base associated with the adoption of the Accelerated Cost Recovery System were not in place for long enough to have had a significant effect on saving; simulation studies (e.g., Summers, 1981 and Auerbach and Kotlikoff, 1987) indicate that many government policies aimed at stimulating savings can have significant effects that are observed only after decades, rather than a few years.

Increases in the Stock Market

Most theories of consumption predict that households will increase their spending in response to an increase in wealth. Since the 1980s witnessed a significant increase in stock market wealth, this may have led to additional consumption. Because the increases in wealth are themselves excluded from national income account measures of income, this, in turn, would overstate the ratio of consumption to true income, and hence understate the true saving ratio.

However, the increases in consumption that may have occurred in response to the rising stock market can explain only a small part of the declining rate of national saving. By far the largest increase in real stock market wealth during the 1980s occurred in 1985, when household equity increased in value by $449 billion in excess of the inflation rate. For the period 1981–1986 as a whole, the cumulative increase in stock market wealth was roughly double this, about $900 billion. Assuming that households consume 3 percent of their wealth each year, a reasonable estimate based on past economic research, this would have accounted for an increase of consumption equal to $27 billion, or .6 percent of *NNP*, in 1986, with smaller increases in earlier years and (because of the crash in 1987) later years as well.

However, this estimate for the effect of wealth changes on U.S. saving is too high for the following reason. The stock market represents less than 15 percent of total U.S. wealth; for other assets there have, on net, been offsetting capital losses over the 1980s. If one adds together capital gains and losses for all U.S. assets net of liabilities over the period 1980 through 1988 the total capital gain is only $260 billion measured in 1988 dollars. This represents only 1.7 percent of total 1988 U.S. net wealth. In the absence of this cumulative capital gain the 1988 rate of private saving would have been 6.5 percent rather than 6.3 percent, a very modest difference indeed.

A Decline in Precautionary and Bequest Saving?

Another potential explanation for the decline in private saving may be the expansion of insurance which reduces the need for precautionary savings. The government today provides disability insurance, unemployment insurance, survivor insurance, earnings insurance (through the progressive tax structure), life span insurance (through its Social Security annuities), old age health insurance, nursing home insurance (through Medicaid) and poverty insurance (through its welfare programs). Economic research suggests that each of these forms of government insurance, while of great economic value, can have the undesired side effect of greatly reducing national savings. Untangling the savings effects of the provision of each of these forms of insurance is a formidable task, and one that is not likely to yield conclusive answers.

A related explanation for the decline in saving is a reduction in saving for bequests, which may tie in with the decline in the birth rate. At least half and possibly as much as two thirds of U.S. wealth can be traced not to life cycle saving for retirement, but rather to private bequests and other intergenerational transfers. It is hard to assess whether there has been a decline in the bequest motive for saving, but such a decline would not be surprising given the general deterioration of the family in the U.S. as evidenced by the dramatic postwar rise in the fraction of marriages ending in divorce and the dramatic postwar decline in the fraction of the elderly, even the infirm elderly, living with their children.

Much of the saving associated with bequests that occurred prior to 1970 may have reflected the absence of significant annuity insurance. In 1960 old age annuities were only a small component of retirement finances. Today, social security and private pension annuities are, more often than not, the major component of retirement finances. Annuitizing one's resources eliminates the possibility of leaving such resources to the next generation. In other words, many of the bequests that occurred in the past may have been unintended, and with annuity instruments now widely available, there is less scope for unintentional bequests. The counterpart of fewer unintentional bequests and the availability of annuity insurance is that one can consume more since annuities have eliminated the concern about spending one's resources too quickly; i.e., the availability of annuities may have reduced significantly precautionary savings in response to life span uncertainty.

Other Factors

There are several other factors that can be dismissed as possible explanations of the decline in U.S. saving in the 1980s. The business cycle is one

such factor. While, as one would expect, each of the different saving rate measures was low during the recessionary period 1981–1983, the rate of saving did not recover during the subsequent and ongoing boom. For example, the national (uncorrected), private, and personal saving rates in 1987 were each lower than they were in 1982.

A second possible explanation is a reduction in income inequality in the 1980s. According to the Keynesian view, a reduction in income inequality would shift more income to the liquidity constrained poorer segment of society and induce greater national consumption. The problem with this line of argument is that income inequality increased rather than declined during the 1980s. According to the Congressional Budget Office (1987), the share of total U.S. disposable income received by the 5 percent of families with the highest disposable incomes was 18.9 percent in 1977, 20.1 percent in 1980, 23.2 percent in 1984, and 23.5 percent in 1988. The share of disposable income received by the poorest 30 percent of U.S. families was 8.6 percent in 1977, 8.5 percent in 1980, 7.6 percent in 1984, and 7.6 percent in 1988.

A third factor is the increase in female labor force participation that occurred during the 1980s. This factor should, however, have increased saving, since one would expect part of the increased earnings of females to be saved. The saving rate should also have increased since, at least in the life cycle model, the saving rate depends of the fraction of workers, who save, to retirees, who dissave. An offsetting possibility is that increased female labor force participation reduced the precautionary saving needed by single-earner couples in the event the single earner becomes unemployed.

VI. SUMMING UP

This paper suggests that demographic change may significantly alter our rate of national saving and our current account position over the next 50 years. The gradual aging of the population is predicted to lead to higher saving rates over the next three decades with declines in the rate of saving thereafter. Associated with these predicted saving rate changes is a predicted improvement in the U.S. current account position in the 1990s, with a very gradual deterioration during the subsequent decades.

While demographics is a potentially very important factor in explaining saving, it does not appear to explain the drop in the U.S. saving rate in the 1980s. Indeed, based on demographics alone, one would have predicted saving rates to be high and roughly equal in the 1950s and 1980s and considerably lower in the 1960s and 1970s. What happened to U.S. saving in the 1980s remains an intriguing puzzle.

APPENDIX

AI. Simulating the Effects of Demographics on Saving Rates

The method used to simulate the effects of demographic change on saving rates can be understood more precisely by looking at the following formula for the national saving rate in year t, S_t.

$$S_t = 1 - \frac{c_{40,m,b}\sum_{a=0}^{120}[R^c_{a,m}\theta_{a,m,t} + R^c_{a,f}\theta_{a,f,t}] + g_{y,b}\beta_{y,t} + g_{m,b}\beta_{m,t} + g_{o,b}\beta_{o,t} + \bar{g}_b}{k_{40,m,b}\sum_{a=0}^{120}[R^k_{a,m}\theta_{a,m,t} + R^k_{a,m}\theta_{a,f,t}] + e_{40,m,b}\sum_{a=0}^{120}[R^e_{a,m}\theta_{a,m,t} + R^e_{a,f}\theta_{a,f,t}]} \tag{A1}$$

The first term in the numerator of the ratio in (A1) is per capita private consumption in base year b. This is expressed as consumption per 40-year-old male in year b, $c_{40,m,b}$, multiplied by a summation. The terms $R^c_{a,m}$ and $R^c_{a,f}$ in the summation are, respectively, the ratios of average male and average female consumption at age a relative to the average consumption of a 40-year-old male. And the terms $\theta_{a,m,t}$ and $\theta_{a,f,t}$ are, respectively, the male and female shares of the population age a in year t. The two terms in the denominator of the ratio in (A1) are defined symmetrically, except that the first deals with capital income and the second deals with labor earnings. The terms $g_{y,b}$, $g_{m,b}$, $g_{o,b}$ and $\bar{g}_b$ are, respectively, the ratio of government consumption expenditure per young person (age 0 to 18), per middle age person (age 19 to 64), per old person (65 plus), and per capita. Finally, the terms $\beta_{y,t}$, $\beta_{m,t}$, and $\beta_{o,t}$ are, respectively, the fraction of the year t population that are young, middle age, and old.

Given base year values of $g_{y,b}$, $g_{m,b}$, $g_{o,b}$, $\bar{g}_b$, $c_{40,m,b}$, $e_{40,m,b}$, and $k_{40,m,b}$ and the values of the relative age-sex consumption, earnings, and capital income profiles (the $R^c_{a,m,t}$'s, $R^c_{a,f,t}$'s, $R^e_{a,m,t}$'s, $R^e_{a,f,t}$'s, $R^k_{a,m,t}$'s, and $R^k_{a,f,t}$'s) one can use equation (1) to determine how saving rates would change with changes in the age-sex composition of the population (the $\theta_{a,m,t}$'s, $\theta_{a,f,t}$'s, $\beta_{y,t}$'s, $B_{m,t}$'s, and $B_{o,t}$'s). The procedure for determining base year values of $c_{40,m,b}$, $e_{40,m,b}$, and $k_{40,m,b}$ is provided in equations (A2) through (A4).

$$C_b = c_{40,m,b}\sum_{a=0}^{120}[R^c_{a,m}P_{a,m,b} + R^c_{a,f}P_{a,f,b}] \tag{A2}$$

$$E_b = e_{40,m,b} \sum_{a=0}^{120} [R^e_{a,m} P_{a,m,b} + R^e_{a,f} P_{a,f,b}] \tag{A3}$$

$$YK_b = k_{40,m,b} \sum_{a=0}^{120} [R^k_{a,m} P_{a,m,b} + R^k_{a,f} P_{a,f,b}] \tag{A4}$$

Equation (A2) indicates that total consumption in year b, C_b, can be expressed as the product of $c_{40,m,b}$ times the sum of the products of the age-sex consumption ratios and the levels of population in year b in a given age-sex category (the $P_{a,m,b}$'s). Equations (A3) and (A4) are the analogous expressions relating $e_{40,m,b}$ to total labor earnings, E_b and $k_{40m,b}$ to total base year capital income, YK_b. Given values of C_b, E_b, and YK_b as well as the terms within the summations of equations (A2), (A3), and (A4), these three equations can be solved for $c_{40,m,b}$, $e_{40,m,b}$, and $k_{40,m,b}$.

The procedure for finding $g_{y,b}$, $g_{m,b}$, $g_{o,b}$, and $\bar{g}_b$ is similar. Specifically, we used Auerbach et al.'s (1989) age-decomposition of government consumption expenditure to determine the values of $g_{y,b}$, $g_{m,b}$, $g_{o,b}$ and $\bar{g}_b$, which stand, respectively, for government consumption per person age 0–24, government consumption per person age 25–64, government consumption per person age 65+, and per capita non–age-specific government consumption, $\bar{g}_b$. Government consumption per capita in year t is then determined by multiplying these four values by their corresponding populations in year t and dividing by the total population in year t. Unfortunately, data are available only to calculate values of $g_{y,b}$, $g_{m,b}$, $g_{o,b}$, and $\bar{g}_b$ for the period of the mid-1980s. Hence, in the calculations presented below, these values are used regardless of the base year indicated.

For each base year the value of total private consumption (used in (A2) to solve for $c_{40,m,b}$) corresponds to the National Accounts figure (unadjusted for durables) for that year. In addition, base year net national product (again unadjusted) is divided between labor and capital income using the national accounts data on employee compensation and proprietorship income and assuming that the share of proprietorship income that represents payments for labor is the same as the ratio of aggregate labor income to net national product.

A2. Simulating the Effects of Demographics on the Current Account

To simulate the effects of demographics on the current account, we begin by assuming a value, r, of the world interest rate. Dividing 1987

capital income from the national income accounts by r gives us an estimate of 1987 U.S. assets, A_{1987}. To find A_{1988}, A_{1989}, through A_{2050} we use the following formula:

$$A_{t+1} = A_t + s_t NNP_t \tag{A5}$$

In (A5) A_t is assets at year t (e.g., 1987), s_t is the year t saving rate as calculated in Section II above with 1987 as the base year, and NNP_t is net national product in year t, which is also calculated as in Section II above with 1987 as the base year; i.e., it is the sum of 1) average capital income of a 40-year-old male in 1987 times the summations of the cross products terms (the $R^k_{m,a}\theta_{m,a,t}$'s and the $R^k_{f,a}\theta_{f,a,t}$'s) plus 2) average labor income of a 40-year-old male in 1987 times the summations of the cross product terms (the $R^e_{m,a}\theta_{m,a,t}$'s and the $R^e_{f,a}\theta_{f,a,t}$'s).

The level of the capital stock at time t is determined by assuming a Cobb-Douglas net (of depreciation) production technology for U.S. domestic output, Y^d_t:

$$Y^d_t = DK^{\alpha}_t L^{1-\alpha}_t \tag{A6}$$

where D is a coefficient whose value is determined in equation (A7), α is capital's share of net national product, and L_t is the supply of labor in year t. The value for α was determined from the National Accounts data. The value of L_t is given by the second summation in the denominator of equation (10). Since the marginal product of U.S. capital must equal the world interest rate r, we have:

$$\alpha D \left[\frac{L_t}{K_t}\right]^{1-\alpha} = r \tag{A7}$$

Given a value for r and K_{1987}, we insert the 1987 value of L_t and use (A7) to solve for D. The value of K_{1987} is determined from the 1987 current account reported in the national accounts. Specifically, $r(K_{1987} - A_{1987})$ is set equal to the 1987 current account deficit less the 1987 trade account (exports minus imports). This equation is then used to solve for K_{1987}. Having determined the value of D in (A7), we use (A7) to predict values of K_{1988} through K_{2050} by inserting the predicted values of L_t for the appropriate year in question. Since the current account deficit in year t, CA_t, is defined as:

$$CA_t = [K_t + 1 - A_t + 1] - [K_t - A_t] \tag{A8}$$

we simply insert the predicted time paths of capital stocks and assets to determine the time path of CA_t.

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