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Spendthrift in America? On Two Decades of Decline in the U.S. Saving Rate

1. *Introduction*

During the past two decades, the personal saving rate in the United States has fallen dramatically. From a typical and quite steady level of around 8% during the sixties and seventies, it has declined to below 2% in 1997, and preliminary estimates put the rate at $\frac{1}{2}$% in 1998 and negative so far in 1999. Figure 1a displays the U.S. personal saving rate from 1959 to 1998 and makes clear the magnitude of the change.[1]

This change does not merely reflect labelling or measurement issues. In particular, for the majority of this decline, it is not the case that businesses or governments have increased their saving with national saving unaffected. Since the National Income and Product Account (NIPA) definitions of savings rates are neither transparent nor representative of basic economic concepts, the simplest way to judge the importance of this shift in the U.S. economy is to examine whether consump-

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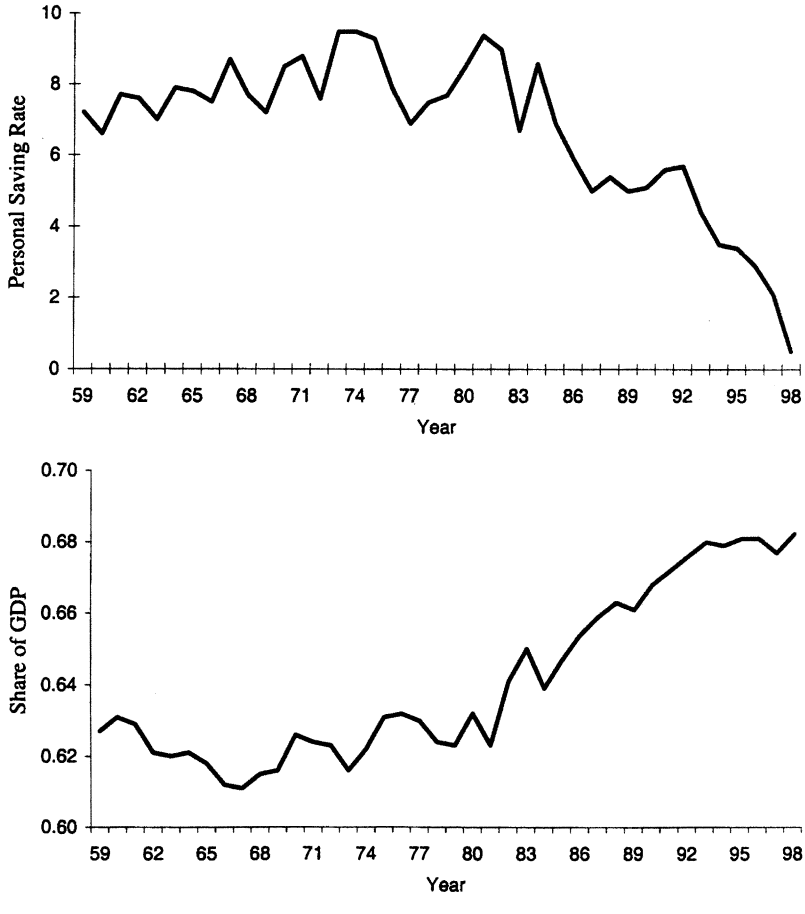
1. An October 1999 revision in the calculation of personal saving raises these numbers but does not alter the twenty-year decline nor any of the main conclusions of this paper. The personal saving rate is defined as one minus the ratio of personal outlays to disposable income. In the national accounts, personal outlays are personal consumption expenditures plus interest paid by persons and personal transfer payments abroad; disposable income is labor income, proprietors' income, rental income, personal interest and dividend income, and transfer payments to persons less personal contributions for social insurance and personal tax and nontax payments.

Figure 1 (a) U.S. PERSONAL SAVING RATE, 1959–1998; (b) U.S. PERSONAL CONSUMPTION EXPENDITURES AS A SHARE OF GDP, 1959–1998



tion has risen as a share of national output. Figure 1b shows that the decline in personal saving has largely been mirrored on the expenditure side of the national accounts. The ratio of consumption to GDP in the United States was roughly constant from 1950 to 1980, and has risen by 6 percentage points during the past two decades.[2]

While the ratio of consumption to income has risen significantly since

2. Since this paper was written (and of importance to the discussion), the Bureau of Economic Analysis has released a major revision of the National Accounts that reclassifies expenditures on software as investment, treats government pension plans in the same manner as private pension plans, and removes some asset transfers from disposable income. The revised data still show an 8 percentage point decline in the personal saving rate and a 5 (rather than 6) percentage point increase in the consumption share of GDP in the past twenty years.

1980, it is worth noting that this ratio has not risen in the past few years. The recent decline in the personal saving rate that has received so much attention from journalists and policymakers is not reflected in the ratio of consumption to output. As the next section shows, this decline is more than offset by increases in saving by governments and businesses.

This paper focuses on the fundamental and significant change in the allocation of the output of the U.S. economy documented in Figure 1b: Why has the largest economy in the world increased its consumption expenditures by 6% of output in a twenty-year period? This change poses a basic challenge to economists as those who seek to explain economic outcomes. Do we understand the allocation of resources?

This consumption boom also has import for the economic future of the United States. Saving is the accumulation of resources on which to base future consumption. Absent offsetting changes in the national economy, higher consumption generally leads to a lower capital stock and thus affects wages and national output in the future. If the present low saving rate represents an optimal response of well-functioning markets to fundamental improvements such as new technologies, then policies designed to stimulate saving are at best unnecessary, since the future is rosy. On the other hand, if high consumption rates are the results of imprudent fiscal policies or malfunctioning markets, then anemic saving signals an avoidably worse future.[3]

Despite the basic prediction that lower saving and investment lowers the capital stock, the aggregate wealth-to-income ratio has actually increased during the period of the consumption boom. While new investment has slowed, the revaluation of existing assets has kept wealth levels high relative to national output, raising the possibility that the capital-to-income ratio is not declining. Put differently, the saving rate including capital gains has not fallen. As is clear from the paper and comments on the value of the stock market in this volume, however, high stock prices may not reflect only high expected future dividends. It seems imprudent to simply assume that saving is in some sense high and that the capital stock is larger than would be inferred from past investment. Instead, this paper considers whether the appreciation of assets, whatever the driving mechanism, can explain the changing allocation of current output. If it can, this suggests that households perceive the increase in the value of the stock market as real wealth creation. As this paper demonstrates, however, the increase in wealth alone does not explain the consumption boom.

This paper begins by laying out the basic facts surrounding the decline

3. While uncovering significant evidence about the behavior of the consumption ratio, this paper does not enter this debate directly. For examples of these arguments see Bernheim and Shoven (1991), Bernheim and Scholz (1993), Gustman and Steinmeier (1998).

in national saving and how a canonical aggregate model can account for these changes. I focus both on several recently observed changes in the U.S. economy and on the main current theories of the increased consumption of output.[4]

I employ two main sources of data to study the increase in the consumption of output. First, the paper uses U.S. national accounts data to compare the timing of the consumption boom with the timing of the candidate driving forces, and to ask what expected changes would be required to rationalize observed household consumption behavior. Second, the work evaluates cross-sectional implications of the theories using a custom-built panel dataset on U.S. households. As first suggested in Skinner (1987), I impute consumption of nondurable goods and services for each household in the Panel Study of Income Dynamics (PSID) using information from the Consumer Expenditure Survey (CEX) and the U.S. national accounts. The resulting dataset contains 80,000 observations on household income, consumption, wealth, and demographic characteristics covering the period of interest.

The analysis leads to the following main results.[5]

First, the decline in measured saving is not purely due to a rise in expenditures without an associated rise in consumption. That is, households are not simply spending more on durable goods and thereby shifting the composition of their savings.

Second, the consumption boom cannot be explained by decreased government purchases "crowding in" consumption. The sum of government and household expenditures on goods and services has also risen over this period. Further, the declines in government spending that would have to be expected to rationalize the consumption boom are, to the author, implausibly large.

Third, the data suggest that at most one-fifth of the increase in the ratio of consumption to income can be explained by changes in the ratio of household wealth to income. The consumption boom precedes the recently observed increases in wealth, and the national saving rate has actually risen coincident with the stock-market boom of the late 1990s. Additionally, the increases in consumption-to-income ratios

4. There is no shortage of theories that can "explain" the decline in saving, once one allows any combination of changing structural parameters or shifting definitions as plausible candidates. This paper limits the scope of its investigation to the main current theories and looks at the data with these explanations in mind. Further, this paper focuses on ruling out monocausal explanations and upon describing behavior.

5. While much relevant literature is cited where appropriate, the literature is too large to cover in detail here. See Browning and Lusardi (1996), Hayashi (1997), and Attanasio (1997b) for an overview of the state of empirical research on saving.

across groups are not related to the distribution of wealth, homeownership, or pension participation. Changes in asset values are not the main force driving the relative increase in consumption.

Fourth, during this period of rising consumption share, the growth rate of real consumption per capita was low and real interest rates were relatively high. Absent a run of expectational errors, the consumption Euler equation implies that the actual or effective discount rate of the representative agent was high. Additionally, there is a strong correlation between the real interest rate and consumption growth within the period of consumption boom. That is, the aggregate consumption Euler equation provides a better description of the data during this period than in previous periods.

Fifth, turning to evaluating explanations that are consistent with such increased impatience, the changing age distribution and income-by-age distribution of the population are not important causes of the consumption boom. Nor, sixth, can financial innovation which relaxes liquidity constraints and potentially reduces precautionary saving be blamed for the consumption boom. Given the observed increases in debt, this source can generate at most one-third of the increase in consumption observed to date.

Seventh, the consumption-to-income ratio of each generation is larger than that of the generation before it.[6] This implies that intergenerational fiscal transfers alone cannot account for the decline in saving. Thus, either different factors have increased the consumption of different generations, or general optimism or a preference shift has increased the consumption-to-income ratios of all households.[7]

In sum, the analysis reveals that each of the major current theories of the decline in the U.S. saving rate fails on its own to match significant aspects of the macroeconomic or household data. The concluding section of the paper discusses some combinations of theories that are consistent with the stylized facts uncovered in this paper and with the limited roles found for the monocausal explanations.

The paper is organized as follows. The next section describes the history of the decline in the personal saving rate and its relationship to the allocation of output. Section 3 presents a canonical aggregate model

6. As will be shown, this can be explained either by a time effect increasing everyone's consumption-to-income ratio or by true cohort effects, as is described here. In this latter case, while the changing age distribution of the population is irrelevant, who is at each age is very relevant.

7. An example of such a combination of factors is federal transfers from future generations to the elderly and financial innovations that allow the young to consume more out of future income.

and the classes of explanations for the consumption boom that the paper considers. Section 4 evaluates a subset of the theories using *U.S.* national accounts data and in doing so provides a more detailed description of the aggregate facts. Section 5 describes the main features and construction of the household-level dataset that is used to further test the theories in Sections 6, 7, and 8. These sections differ by methodology: Section 6 decomposes the consumption-to-income ratios into age, time, and cohort effects; Section 7 models the cohort effect and estimates consumption functions; Section 8 estimates Euler equations. Section 9 concludes. A data appendix is provided.

2. *The Decline in the U.S. Saving Rates*

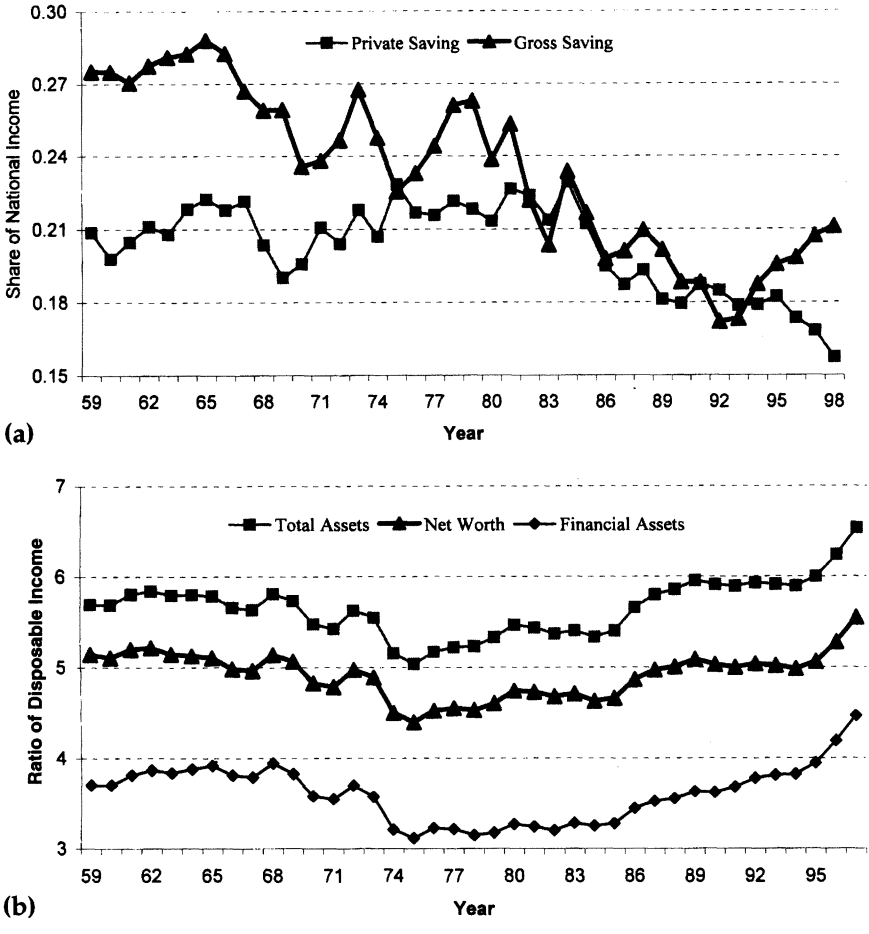
Before turning to the theoretical determinants of the consumption ratio and evaluating these determinants using the aggregate data, this section presents the stylized facts concerning the declining U.S. saving rates.[8] It is important to clarify what has occurred before turning to possible explanations. The section is structured as being about saving because it is national saving (plus international capital flows) that equals total national investment.

Is the precipitous decline in personal saving shown in Figure 1a leading to lower national saving, or is public and business saving offsetting the decline? Actually, from private-saving data, it is not even clear that households themselves are saving less. National accounts data misallocate several categories of saving between private and business saving. Personal saving includes the saving of noncorporate, nonfinancial businesses, such as sole proprietorships, partnerships, and nonprofit organizations, which might be better included in business saving. Additionally, because disposable personal income includes nominal rather than real interest payments to businesses, personal saving is overstated relative to business saving.[9]

Given that personal saving is confounded with business saving, the first question is what has happened to their sum, private saving. Figure 2a displays the private saving rate—the ratio of private saving to national income—over the past forty years.[10] Prior to the precipitous de-

8. In contemporaneous research, Gale and Sabelhaus (1999) analyze the aggregate data on saving and wealth and reach similar conclusions to those of this section.
9. See Hendershott and Peek (1988) and Summers and Carroll (1987).
10. NIPA saving-rate measures have recently been revised so as to exclude the capital gains distributions of mutual funds from both saving and disposable income. This is consistent with the national accounts' purpose of describing the allocation of newly produced, final value added. Unfortunately, this revision only goes back to 1982, so that there is a break in the savings series in that year. However, these distributions account

Figure 2 (a) GROSS SAVINGS RATES 1959–1997; (b) HOUSEHOLD ASSETS AND NET WORTH



cline in personal saving, the private saving rate was nearly constant. This stable relationship was known as Denison's law (Denison, 1958), but this law appears to have been repealed.[11]

for only $\frac{1}{4}$ percentage point of the saving rate in the 1980s. Thus, while this revision lowered measured private saving in the 1990s significantly, carrying the revision back farther would have negligible effect on measured saving rates and the conclusions of the present analysis.

11. In part, Denison's law is also based on an observed high negative correlation between personal and business saving. Hendershott and Peek (1988) argue that mismeasurement generates most if not all of this negative correlation and thus that Denison's law was never passed in the first place.

Turning now to government saving, higher saving by the government, holding expenditures constant, leads to lower taxes in the future. The principal of Ricardian equivalence states that if taxes are nondistortionary, this offset is complete: households observing higher government saving save less themselves, if government purchases of goods are held constant. Figure 2a also shows that government saving—the difference between private and gross saving—declined through the 1950s, 1960s, and 1970s and has only rebounded from near zero in the early 1990s.[12] Thus gross saving declined steadily from the late 1960s to the early 1990s and has risen recently. We can conclude that while the last five years of declining private saving have been offset by increased government saving, national saving has still fallen substantially in the past twenty years.

One reason for pausing to examine national saving—and not simply focusing on consumption-to-income ratios throughout—is that saving and investment have moved in lockstep over most of the postwar period. Capital inflows have not offset the decline in saving, either because of an offsetting temporal pattern of changes in the world economy or because of any one of the proposed rationalizations of the Feldstein–Horioka puzzle. Nevertheless, declining national saving has been associated with a large decline in new investment as a share of GDP over the past twenty years. Ultimately, and ceteris paribus, one would expect this decline of roughly one-fifth in gross investment to lower the U.S. capital stock per worker by one-fifth.

As discussed in the introduction, however, the value of extant assets, has not declined. The stock of wealth in the U.S. has risen as a share of income over the past twenty years. Figure 2b shows that net worth, as measured in the flow-of-funds data, has increased as a share of disposable income during the period of declining saving. While the flow of the share of output stored for future production is declining over time, the value of the stock is rising. Put slightly differently, while active saving has decreased, the change in household wealth as a share of income has increased.[13]

These coincident trends raise two puzzles. First, why has wealth risen while saving has fallen? This question is addressed elsewhere in this volume. Second, what has driven the decline in active saving and the

12. This is the official measure of government saving, which does not include changes in government debts associated with social security and the implicit and violable promises to future generations. Officially, government obligations held by the public rose by about 20% of GDP from 1979 to 1995 and have declined by about 5% since.

13. This fact is also present in the PSID data that will be used subsequently (Hurst, Luoh, and Stafford, 1998).

increasing consumption of output? In the rest of this paper we focus on the latter question.

3. *The Canonical Theory and Main Explanations*

This section discusses the main explanations for the consumption boom in the context of a canonical macroeconomic model. In subsequent sections, these explanations are evaluated using aggregate time-series evidence and panel data on household behavior.

To provide a framework for analyzing the decrease in saving and the increase in the consumption share of output, I begin with a standard Ramsey economy. Aggregate output, Y, is produced from the aggregate capital stock, K, and total labor in the economy, N, using a constant-returns-to-scale production technology:

$$Y = F(K, AN),$$

where A is an exogenous Harrod-neutral technology that grows at rate a. Let the labor force grow at exogenous rate n, and let capital depreciate at rate δ. Then one can rearrange the standard capital accumulation equation to solve for the consumption share of output:

$$\frac{c}{y} = 1 - g - (n + a + \delta)\frac{k}{f(k)} - \frac{\dot{k}}{f(k)}, \tag{3.1}$$

where C is aggregate consumption, lowercase letters denote per-effective-worker values (e.g., $c \equiv C/AN$), g is the rate of government consumption of output in steady state, and $f(k) \equiv F(k,1)$. In steady state, the consumption ratio is related only to the accumulated capital stock, the share of output consumed by the government, and the exogenous rates of technology growth, population growth, and depreciation.

In the canonical Ramsey model with a single infinite-lived representative agent maximizing the present discounted value of per capita utility flows, the steady-state real interest rate and thus the capital–output ratio are tied down by the modified golden rule. Assuming a Cobb–Douglas production function, the consumption share of output in steady state is

$$\frac{c}{y} = 1 - g - \frac{\alpha(n + a + \delta)}{r + \delta} \tag{3.2}$$

$$= 1 - g - \frac{\alpha(n + a + \delta)}{n + \frac{a}{\sigma} + \rho + \delta}, \tag{3.3}$$

where r is the real interest rate, ρ is the discount rate of the representative agent, α is the share of output that is paid to capital, and σ is the intertemporal elasticity of substitution of the representative agent. The consumption ratio is increased by increases in impatience and by decreases in government spending, the growth rate of population, the capital share, and the intertemporal elasticity of substitution.[14] A decrease in the depreciation rate has a theoretically ambiguous effect but, for reasonable parameter values, increases the consumption share of output. Similarly, an increase in the growth rate of productivity has an ambiguous effect but, for reasonable parameter values, increases the consumption share of output.

Of the large number of possible factors that can increase the consumption share according to equation (3.3), this paper focuses on several that are noticed in the literature or suggested by recently observed changes in the economy. First, the share of output consumed by the government has declined over the past twenty years. A declining rate of government spending causes a consumption boom. Second, household wealth has increased despite low active saving, as documented in Figures 1 and 2. An increase in the capital stock causes a transitory consumption boom.

Finally, an increase in the discount rate of the representative agent increases the consumption share of output. While this cannot be observed directly, several existing theories imply an increase in the effective discount rate of the aggregate consumer.[15] First, the social security system is currently making large transfers from future generations to those alive today. Considering the representative agent derived from a life-cycle model, this increased intergenerational redistribution temporarily increases the effective discount rate of the representative agent.[16] Thus the social security system is considered as a potential explanation for the increase in the consumption share. Second, since households at different ages have different propensities to consume out of total resources, changes in the age distribution of the population change the effective discount rate of the representative agent. The aging of the baby boom generation and the increased life span of the typical American have changed the demographic structure of the U.S. and may also have driven up the consumption share of output.

14. For all of these effects, the change in consumption share at impact is the same as in the long run except that a decrease in the capital share can cause the consumption share to decline at impact.

15. I do not consider one potential explanation, advanced in Carroll and Weil (1994) and Paxson (1996). Habit formation tends to lead the growth rate of consumption to decline slowly following a slowdown in growth.

16. That is, in a certainty model, intergenerational transfers to the present increase the propensity of the representative agent to consume out of current and expected output.

Third, in a model in which some households face large idiosyncratic risk or liquidity constraints, some saving is driven by precautionary or liquidity concerns. In the past twenty years, there has been an increase in the financial instruments employed by Americans and a significant increase in the ratio of debt to income. Thus I consider relaxed liquidity constraints as a possible explanation for the increase in the consumption-to-income ratio.[17] Finally, while not observed, there has been speculation that saving behavior differs by cohort. One version of this story is that households who did not live through the Great Depression have a lower propensity to save than those who did. I examine whether there is evidence of an increase in the discount rate of the representative agent due to more patient older generations being replaced by more impatient younger ones.

4. *A Quick Tour of Aggregate Evidence*

In this section, I analyze which if any of the explanations just discussed are consistent with the observed changes in the aggregate economy. I focus on timing, on relative magnitudes, and on the composition of aggregate consumption. This first pass at the data is complemented later in the paper by a thorough evaluation using household-level survey data.

Before seeking to explain the increase in the consumption share, this section dismisses the possibility that consumption expenditures have increased while consumption has not. Suppose that there were a relative preference shift or price decline such that the representative household sought to increase the share of its consumption flows that are due to durable goods. Since the NIPA measure expenditures rather than consumption, an increase in the share of consumption coming from the service flows from durable goods would generate a boom in consumption expenditures. In fact, however, the observed increase in consumption expenditures relative to income would not represent a decline in saving rates, but rather a shift of saving from capital to durable consumption goods.[18]

This supposition is easily rejected by an examination of household budget shares. Working with reference to GDP rather than total consumption, the ratio of expenditures on durable goods to GDP has re-

17. See Caballero (1991), Ayagari (1993), and Carroll (1997).

18. Durable goods do not include housing. Housing services are counted as consumption, while housing-stock depreciation and investment are counted as capital consumption allowance and investment. Changes in household wealth due to changing homeownership patterns are correctly reflected in the figures on saving. See Bureau of Economic Analysis (1987, 1997).

mained steady since 1959, falling by a tenth of a percentage point from 1959 to 1979 and rising by a tenth of a percentage point since.

Turning now to the main explanations proposed in the previous section, we will see that there is little aggregate evidence that declines in government spending or appreciation of existing assets caused the increase in consumption to income. Since during the past twenty years the real interest rate was relatively high and the growth rate of consumption relatively low, the data do suggest that the effective discount rate of the representative agent has increased.

4.1 REDUCTIONS IN GOVERNMENT PURCHASES

Is the consumption boom driven by a decreasing share of output purchased by the government, due to the so-called "peace dividend" for example? In steady state, the canonical model of Section 3 implies that the share of national output consumed by households and the government together is constant [equation (3.3)].

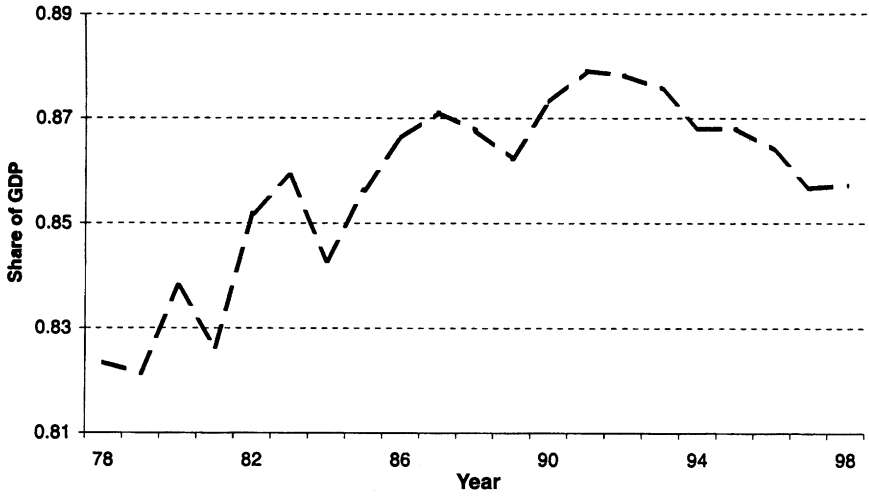
A steady-state explanation can be quickly dismissed. Figure 3 shows that the share of output devoted to the purchases of both households and governments has risen over the past twenty years. The purchases of goods and services by governments have fallen by about 3 percentage points of GDP over the past ten years, but this decline is concentrated after most of the increase in the consumption share.[19] A small piece of evidence is provided by the real interest rate. The real interest rate should be unchanged by a decrease in the demand for output by the government. During the past twenty years, the real interest rate has been singificantly higher than it was in the previous twenty.

There is however the possibility that a non-steady-state explanation could work. That is, could the consumption boom be due to the expectation of both the currently observed decline in government spending and further declines in government spending in the future? This hypothesis is consistent with a high real interest rate and a high consumption share of output. If households expect lower government purchases in the future, consumption of the extra output available is smoothed by reducing investment and the capital stock in the present, thus increasing the real interest rate.

To evaluate this explanation, I ask what changes would have to be expected to rationalize the observed consumption boom. To keep matters transparent, general, and easily reproducible, the present values are calculated holding the real interest rate constant. Such experiments pro-

19. Also, the constant consumption share and the declining share of government purchases over the past five years suggests no "crowding in" of consumption in response to the reduction in the share of government expenditures.

Figure 3 CONSUMPTION AND GOVERNMENT SPENDING AS A SHARE OF GDP



vide a lower bound on the expected future declines in government spending.[20]

First, what is the expected steady-state share of government spending? The average ratio of government and consumption purchases to GDP from 1959 to 1979 is 84%. Given the current ratio of personal consumption expenditures to GDP of 68%, equation (3.3) implies that the expected steady-state ratio of government spending to output is 16%.

Second, what accumulated value from the consumption boom must be recovered from lower government spending? Consider first the counterfactual that the consumption ratio remained at its 1959–1979 value over the 1979–1998 period. The present value of the excess of the observed consumption series over this alternative stands at 5782 billion 1992 dollars, or three-quarters of a year of GDP, when accumulated at a 3% real interest rate. The decline in government spending as a share of GDP

20. The fact that the partial equilibrium experiment provides a lower bound can most easily be seen in two steps. First, consider the household budget constraint. Because the capital stock declines as consumption rises and then rises as government spending further declines, the real interest rate is high when the household is borrowing from the future (reducing capital below the steady-state level). Thus, to "pay off" the early consumption boom requires greater saving (a greater decline in government spending in the future) than if the interest rate had been constant. Second, since we see that the current ratio of consumption to income and the real interest rate should decline as we get to steady state, the steady-state consumption-to-income ratio is actually higher than the observed one, thus requiring a still-lower steady-state level of government spending.

since its local peak of 21% in 1987 cumulates to only 1400 billion 1992 dollars to date.

One path of government purchases that can rationalize the consumption boom is that the ratio of government purchases to GDP declines by half a percentage point a year to 13%, stays there for 15 years, and rises again by half a percentage point a year to 16%. Thus, to rationalize the consumption boom from this source requires expectations of extreme declines in government purchases. To date, no government spending movements have occurred that can rationalize more than a small fraction of the consumption boom.

4.2 APPRECIATION OF EXISTING ASSETS

As shown in Figure 2b, the value of assets owned by the representative household has been increasing relative to its income. Can this rise explain the increase in the consumption-to-income ratio?

First, what might generate the large increases in the ratio of net worth to income while the investment share is low and the real interest rate is high? If households realize that the capital stock was higher than they had thought, then the consumption share would increase, but, counterfactually, the real interest rate would be low. Instead suppose that households expect a big increase in output in the future. Then households should decumulate capital, the real interest rate rise, and consumption rise as a share of output. These real-interest-rate, consumption, and output movements are as observed in the data. If, in addition, firms must invest now, for example in information technologies, in order to reap these future productivity gains, then it is also possible for the theory to predict an increase in the ratio of net worth to income, as in Greenwood and Yorukoglu (1997). If this investment is not measured as output or investment, then consumption rises as a share of output.[21]

An alternative theory is simply that asset prices follow fads or bubbles. In either case, two problems are encountered in trying to explain the consumption boom with the increase in wealth.

First, the timing is wrong. The increase in the wealth-to-income ratio is mainly due to the increases in the values of financial assets—largely stocks—as shown in the lowest curve in Figure 2b. This increase occurs primarily in the last five years, a time when personal saving is declining but the consumption-to-output ratio is constant.

Second, focusing on the years over which the consumption share of

21. See Greenwood and Yorukoglu (1997) and Greenwood, Hercowitz, and Krusell (1997), or assume that the future increase in productivity is associated with certain existing pieces of capital. Another possible shift in technology is a decrease in the capital share of the economy.

income increased, we see that the total increase in the ratio of net worth to income from the late 1970s to the mid-1990s equals about one-third of a year of GDP. The marginal propensity to consume out of wealth must be one-sixth to rationalize the consumption boom. If one assumes such a high marginal propensity to consume, however, then the lack of a consumption response to recent increases in wealth is puzzling.

A role for wealth accumulation becomes more plausible if one ignores timing and simply observes that budget constraints relate consumption to wealth. The increase in the ratio of net worth to income from the late 1970s to 1997 amounts to two-thirds of a year of GDP. The marginal propensity to consume out of wealth need now only be 9% to rationalize the consumption boom.[22] Thus, while the aggregate data cast some doubt on the role of wealth, this explanation for the consumption boom is a main focus of the subsequent analysis of household data.

4.3 INCREASES IN IMPATIENCE OR THE PROPENSITY TO CONSUME

As noted at the end of Section 3, several current explanations argue that the effective discount rate or the propensity to consume of the representative agent has increased. Such an increase is consistent with two main coincident facts. First, as already mentioned, the real interest rate was high during the consumption boom relative to the previous two decades. This suggests that the demand for output is relatively high. Second, as documented in the first two rows of Table 1, the growth rate of real consumption per capita actually has slowed. Within the context of a Ramsey economy, the Euler equation governs consumption growth. Without a change in the effective discount rate, a higher real interest rate should be associated with a higher average growth rate of consumption, not a lower one.

I now turn to two of the explanations discussed at the end of Section 3: increases in government transfers from future to present generations, and financial innovation and increases in debt. These explanations are also evaluated in Sections 6, 7, and 8, using cross-sectional implications of these theories and household data.

4.3.1 Increasing Government Transfers to Older Generations During the period of the increasing consumption share of output, the U.S. government has increased its reallocation of wealth from future to current generations. In a pure life-cycle model, the beneficiaries of these transfers

22. Poterba and Samwick (1995) and Ludvigson and Steindel (1999) also demonstrate that the high-frequency relationship between stock-market value and consumption is weak.

Table 1 CONSUMPTION GROWTH AND EXPENDITURE SHARES

	Real Per Capita Annual Growth Rate (%)			
	1959–69	*1969–79*	*1979–89*	*1989–98*[a]
Total PCE	3.0	2.4	2.0	1.6
Nondurable goods and services	2.8	2.3	1.8	1.4
	Change in Share of GDP (%)			
	1959–69	*1969–79*	*1979–89*	*1989–98*[a]
Total PCE	−1.2	0.7	3.8	2.1
Durable goods	0.3	−0.4	0.3	−0.2
Nondurable goods	−3.5	−1.4	−3.0	−1.9
Services	2.0	2.5	6.5	4.2
Medical care	1.3	1.6	2.6	1.7
Other services	0.8	0.3	2.3	1.9
Housing	0.0	0.0	1.2	0.2

[a] 1998 estimates are preliminary.

consume more than their pretransfer wealth, while other generations consume less. In the United States, social security and Medicare are the largest of these programs, and the payments to the elderly have been consistently rising, as has the share of medical care in total consumption. Gokhale, Kotlikoff, and Sabelhaus (1996) argue that this redistribution can explain the consumption boom.

To provide a first evaluation of this explanation, the second panel of Table 1 presents the budget shares of different categories of consumption, including medical care. The boom in consumption is more than entirely due to increased consumption of services, of which medical care is a major component. The output share of purchases of goods—nondurable and durable—has declined by nearly 10 percentage points since 1959. Two-thirds of this decline is a steady decrease in the share of consumption that is food. Within services, the largest increases in consumption are due to spending on medical care and on other services.[23] From 1979 to 1998, the growth in the share of medical care is 4.3% and the growth in the share of other services is 4.2%, both large when compared to the 5.9% increase in the total consumption to GDP ratio. This

23. Other services include transportation services and household operations (which are usually their own categories) and miscellaneous services related to clothing, accessories, and jewelry (such as cleaning, repair, and storage); personal business such as banking, legal, and funeral services; recreational services such as cable TV, club memberships, theater tickets, and pet-related costs; religious activities; foreign travel; and finally education and other day-care costs. See Bureau of Economic Analysis (1990).

seems to suggest that the consumption boom can largely be explained by government provision of medical care free of charge to the elderly.

However, a slightly different picture emerges if one compares these recent changes, which occurred contemporaneously with the consumption boom, with the changes that occurred over the previous twenty years, during which the consumption-to-GDP ratio was constant. Table 1 again reveals that services growth is, at least in an accounting sense, the cause of the recent consumption boom. But, relative to growth over the previous twenty years, the increased consumption of services is more evenly distributed among nonmedical nonhousing services, medical services, and housing. The change in medical services as a share of output from 1979 to 1998 exceeds the change over the previous twenty years by 1.4 percentage points. It is also worth noting that the transition to Medicare was largely completed prior to the consumption boom.[24]

In sum, there is evidence that the consumption boom is concentrated in spending on services, but not that this increased spending on services is disproportionately concentrated on medical care. Since this evidence is far from conclusive, I later evaluate the role of intergenerational transfers, including Medicaid, by studying which households were "overconsuming" relative to their ages, wealth, and incomes, and asking whether these households are in cohorts that are receiving large intergenerational transfers. In good macroeconomic tradition, the remainder of the paper will focus on output as one good.

4.3.2 Financial Innovations and Increases in Debt During the past twenty years, gross debt has risen as a share of disposable income. As shown in Figure 2b, the difference between the ratios of total assets to disposable income and net worth to disposable income have increased from 0.7 to nearly 1. If this increase represents relaxed liquidity constraints or financial innovation that allows previously constrained households to borrow to support consumption, then that innovation would lead to a transitory consumption boom. During the past twenty years, credit cards have become more widely available and an increasing amount of debt is held on them. Also, the minimum down payment required to purchase a house has declined, and the number and visibility of financial instruments available to borrow against home equity have increased.

Financial innovations are not able to account for a large increase in consumption. As noted in the previous subsection, the share of expenditures on housing services rises during the consumption boom. However, the increase in the ratio of debt to output is just over 20%. As calculated

24. See Bosworth (1996).

in Section 4.1, the present value of the consumption boom is three-quarters of one year of GDP. If the increase in the debt ratio were entirely caused by an exogenous increase in households' ability to borrow, then financial innovation could explain at most 30% of the increase in consumption to income to date.

4.4 THE LIMITS OF AGGREGATE EVIDENCE

Using only aggregate data, a significant difficulty in understanding the decline in the saving rate is lack of exogeneity. Thus this paper now turns to household-level data. This approach has three advantages. First, the composition of households has changed significantly over the past twenty years. There are more retirees, more single-parent families, and greater dispersion in household income. This paper uses household-level data to evaluate whether such changes have caused the decline in the saving rate. Second, several possible causes of the consumption boom give strong predictions about the cross-sectional distribution of consumption ratios. For example, intergenerational transfers are expected to raise consumption by the currently elderly and reduce it for the currently young. Finally, absent full consumption insurance, household propensities to consume out of idiosyncratic asset values and income levels can be used to estimate the response of the aggregate economy to these variables.

The next section describes the construction of a novel dataset that combines information from two household-level survey datasets and NIPA data to generate a panel dataset with information on consumption, income, and wealth at the household level. The remainder of the paper uses this dataset to evaluate theories of the increase in aggregate consumption relative to income.

5. *Constructing a Household-Level Dataset*

In order to study the consumption behavior of households, I employ the Consumer Expenditure Survey (CEX) to impute the consumption of services and nondurable goods to each household in the Panel Study of Income Dynamics (PSID) from 1979 to 1994. This yields a panel dataset on consumption of households that includes a large set of demographic and income information as well as three years of detailed wealth information. [Skinner (1987) pioneers the use of the CEX to impute consumption to the PSID.] This section briefly describes my procedure for imputation and the important features of the final dataset. Additional details are provided in the Appendix.

5.1. THE PSID

The PSID has been used extensively to study year-to-year fluctuations in consumption, and the main characteristics of the dataset are reasonably well known. For the present analysis, using PSID households as the unit of analysis has three main advantages. First, the survey provides panel data over much of the time period of interest on over 5000 households per year. Data from 1979 to 1994 are used to match the timing of the consumption boom.[25] The PSID provides weights so that the means in any year or category of household can be aggregated to produce a nationally representative sample.

Second, the Survey has repeated measures of food consumption and excellent information on household income. The main measure of consumption is usual weekly food consumption, and this information has been gathered in every year of interest except 1988 and 1989. Food consumption is measured with error, and this has hampered studies working with Euler equations and relating annual consumption changes to observable variables. In much of this study, the focus of interest will be long-term movements or movements across groups of people, so that this mismeasurement creates fewer difficulties. The fact that food consumption is not typical of all consumption expenditures is more of a concern, and this concern leads to the joint use of the CEX, as subsequently described.

Income in the PSID is total posttransfer, pretax income, so that it is not completely comparable to national income in the NIPA. Nonetheless, as demonstrated in the appendix, the ratio of food consumption to income constructed from aggregating the PSID data has the same temporal pattern as that of the NIPA. The correlation between the PSID series and the NIPA series is 0.93.

Third, and most importantly, the survey contains accurate information on wealthholding of households in 1984, 1989, and 1994, a time period covering the heart of the consumption boom. Such information is not available in the CEX alone. The PSID data on wealth include wealth held in saving and checking accounts, money market accounts, certificates of deposit, bonds, stocks, mutual funds, IRAs, cash value of life insurance, trusts and estates, main home, second homes, investment real estate, cars, trucks, boats, motor homes, farm and business wealth, and collections of things for investment purposes (e.g., baseball cards), all less credit card, mortgage, and "other" debts. The wealth data are comprehen-

25. These include income information from the Survey year 1995. The 1994 and 1995 data are in early-release form, and thus the relevant variables must be constructed from raw data.

sive and do an excellent job of reproducing the wealth of the bottom 99% of the wealth distribution in these categories of wealth (Juster, Smith, and Stafford, 1999). The only real shortcoming of the PSID wealth data is that pension wealth is unavailable. The PSID does report whether the household has a pension, and that information is used here.

In order for a household to be included in the analysis, it must have all the necessary information for the year in question. Further, the observation is dropped if any of the necessary information is a major assignment made by the PSID staff.

5.2 THE CEX

In order to use the PSID to analyze the increase in the consumption share of output, this work imputes the consumption of nondurable goods and services for each household. I first estimate the relationship between this larger measure of consumption and a household's level of food consumption and demographic characteristics, using data from the Consumer Expenditure Survey (CEX). The consumption of nondurable goods and services of households in the PSID is then predicted using this estimated relationship.

The CEX is conducted by the Bureau of Labor Statistics in order to construct baskets of goods for use in the bases for the Consumer Price Index and has been run continuously since 1980. The survey has excellent coverage of consumption expenditures, reasonable data on liquid assets, and income information of moderate quality.[26] The survey interviews about 5500 households each quarter and has households keep records of consumption expenditures, which are then collected by the survey at the end of four three-month interview periods. About half of all households make it through all the interviews, and sample weights are given so that a representative sample of nonrural households can be recovered. The CEX represents the best source of information on household consumption across a large set of categories.

The data used here come from the family files of the CEX from 1980 to 1993 and from extracts made publicly available by the Congressional Budget Office and John Sabelhaus through the NBER.[27] Each household contributes one data point to the employed sample. I drop any household that is classified as an incomplete income reporter, that has any of the crucial variables missing, or that does not report an income measure contemporaneous with the consumption data.[28] I construct variables

26. See Lusardi (1996), Attanasio (1994), and Branch (1994).
27. See Bureau of Labor Statistics (1993) and http://www.nber.org/ces_cho.html.
28. This procedure cuts nearly all households that are listed in the CBO/Sabelhaus/NBER data as not completing all the interviews. The weights adjusted by the CBO for attrition are employed.

measuring food consumption and consumption on all NIPA categories of nondurable goods and services consumption. Income is pretax total family income to match the concept in the PSID.

Finally, as for the PSID, I construct the ratio of food consumption to income from the CEX and compare this with the NIPA series. The correlation between the CEX and NIPA series is 0.78, which is not as high as that from the PSID. However, as discussed in the Appendix, it is an acceptable level for present purposes.

5.3 IMPUTING EXPENDITURES ON NONDURABLE GOODS AND SERVICES

Turning to the imputation of consumption for households in the PSID, two important factors drive the specification of the imputation. First, what are the correct theoretical concepts that shift the relative utility of consumption of food and nonfood items? Given that food has declined significantly as a share of consumption over the period of interest, to impute nondurable and services consumption to households it will be necessary to recognize both that the relative price of food changes through time and that food is a necessity, so that its budget share declines with increasing wealth. Further, household characteristics such as family size, number of earners, and retirement status may shift the relative utility of food consumption vs. consumption of other goods.

Second, what variables are measured in similar ways in both surveys? The imputation is only valid if the regressors used in the estimating equation are the same variables as those in the predicting equation. As discussed in the Appendix, there is some variation in the relative levels of the consumption and income series, but the factors of interest are the time trends. For all the regressors, the survey questions, the levels, and the time trends are compared between the surveys, and they match reasonably well.

The imputation proceeds in four steps. First, using the CEX data, the log of expenditures on nondurable goods and services is regressed on a cubic polynomial in the log of food consumption and a set of regressors designed to allow preferences for relative consumption to vary by family size, age, education level, labor-force status, and retirement status. To capture differences in relative prices of goods over time, the mean is allowed to vary by year. The regression employs 37,730 households and explains 80% of the variation in household consumption.

Second, the estimated parameters are used to predict consumption of nondurable goods and services for each household in the PSID. Third, the imputed consumption for each household is treated as a relative consumption level, and the total consumption across households is

scaled up to include medical purchases by the government. This step is similar to that of Gokhale, Kotlikoff, and Sabelhaus (1996), who assign medical consumption across ages. Their medical-care adjustments employ more detailed age-specific adjustments but do not assign these expenditures in relation to individual consumption. Finally, the consumption of nondurable goods and services in the NIPA in each year is allocated across households in proportion to each household's consumption from the third step.

After this imputation, I have a true panel dataset that covers 16 years from 1979 to 1994 and contains measures of income, nondurable and service consumption (for all years except 1988 and 1989), and wealth in 1984, 1989, and 1994. I turn now to describing the evolution of consumption ratios across broad groups of the population. All nominal data are made real using a price index constructed by dividing nominal consumption of services and nondurable goods by the same real quantity, where nondurable and services consumption is made real using the NIPA chained price indexes. Data for the second quarter of the year of interest are used.

From here on the term "consumption" is used interchangeably with the more cumbersome term "consumption of nondurable goods and services."

6. *Growth and Demographic Structure: Age, Cohort, and Time Effects in Consumption*

The United States has experienced a large increase in the share of the population that is over 65 years of age and a bulge in the population distribution associated with the aging of the baby boom generation.[29] If households of different ages have different propensities to consume out of lifetime income, then there is variation in the representative agent's discount rate. For example, middle-aged households wish to consume at a greater rate than young or old households since they tend to have more members. Thus an economy in which a population bulge is entering middle age looks like a canonical Ramsey economy with a temporarily higher effective discount rate. Are the observed fluctuations in the U.S. age distribution leading to fluctuations in the discount rate of the representative agent that are in turn pushing up the consumption-to-income ratio?

29. In addition, there is a long-term trend towards slower population growth in the United States.

Table 2 CELL SIZES FOR AGE AND COHORT GROUPS

Cohort Born	*Cell Size*	*Age Group*	*Cell Size*
1905–09	1,722	19–24	7,090
1910–14	2,799	25–29	12,838
1915–19	3,264	30–34	13,075
1920–24	3,973	35–39	10,427
1925–29	4,725	40–44	7,319
1930–34	4,488	45–49	5,263
1935–39	4,135	50–54	4,702
1940–44	5,462	55–59	4,421
1945–49	9,331	60–64	4,225
1950–54	13,024	65–69	3,850
1955–59	13,627	70–74	3,063
1960–64	8,339	75–85	3,208
		85+	583
1893–05[a]	1,176		
1965–73[a]	3,999		

[a]Partially observed.

6.1 WHO ARE CONSUMING MORE OF THEIR INCOME?

Over the period in question, the elderly as a group have increased their share of consumption. This fact suggests an important role of decreasing lifetime wealth of the young and/or increasing transfers to the elderly. However, this trend significantly predates the current data and the consumption boom.[30] Following in the footsteps of previous studies using micro data, the analysis of the household data begins by describing the evolution of consumption and consumption ratios across different age groups and time periods.[31] Next, this section uses a simple life-cycle framework to identify the role of demographics in the consumption boom.

The analysis first groups the data into birth cohorts and age groups. Table 2 shows the cells and the cell sizes chosen for the analysis. Ages are grouped into 13 five-year cells, and the cohorts are also split into 12 cells.[32] The number of households in each cohort cell and age group

30. See Gokhale, Kotlikoff, and Sabelhaus (1996, Figure 1).

31. This approach is employed in the study of consumption and saving by Deaton and Paxson (1994), Attanasio (1997a), Deaton and Paxson (1997), and Alessie, Kapteyn, and Lusardi (1998).

32. Two *partial* cohorts are in the sample for too little time to properly identify their actual cohort effect. Of these cohorts, the youngest is only observed in the relevant age range for about half the sample. The oldest has some members in the sample in every year,

varies over time. There are 14 years of data, spread over the 16 years 1979 to 1994. In general, each cohort group and age group will be denoted by the middle age or year in its range. The number of data afforded by the PSID is a significant advantage: there are over 80,000 observations on household consumption and income. This is an unweighted look at the data. Sample weights imply quite a different age and cohort distribution of the data, one that is representative of the U.S. noninstitutional population.

To begin, I use the sample weights and data in each cohort group to construct a measure of the average log consumption of each cohort at each age. Figure 4a displays the consumption of each cohort at different ages. The life-cycle pattern of hump-shaped consumption is clearly visible.[33] Also noticeable is the artificially sudden rise in consumption that occurs at age 65 due to the allocation of medical expenditures by the imputation procedure.[34] The figure shows, for any cohort, the combination of both age and time effects at work. None of the effects are separately identified. It could be that all households have the same lifetime wealth and that the "endpoints" of each segment do not join due to time effects that raise the endpoint of each cohort's age series of consumption. However, productivity growth implies that younger cohorts are richer and so consume more than their elders did at the same age. If there were no time effects, then consumption profiles of younger cohorts would lie above those of their elders due solely to cohort effects, which would be due in turn to productivity growth. To identify the separate effects of age, time, and cohort requires identifying assumptions, which are provided shortly.

Figure 4b displays the same set of information as Figure 4a, but by year and for only four cohorts. This figure shows that over the period of the consumption boom, the cohort whose consumption has risen the most is that of households born between 1955 and 1959, the youngest cohort. While this would seem to be evidence that this younger group is, in an accounting sense, the cause of the consumption boom, in fact, the age profile of consumption for this cohort should be increasing.

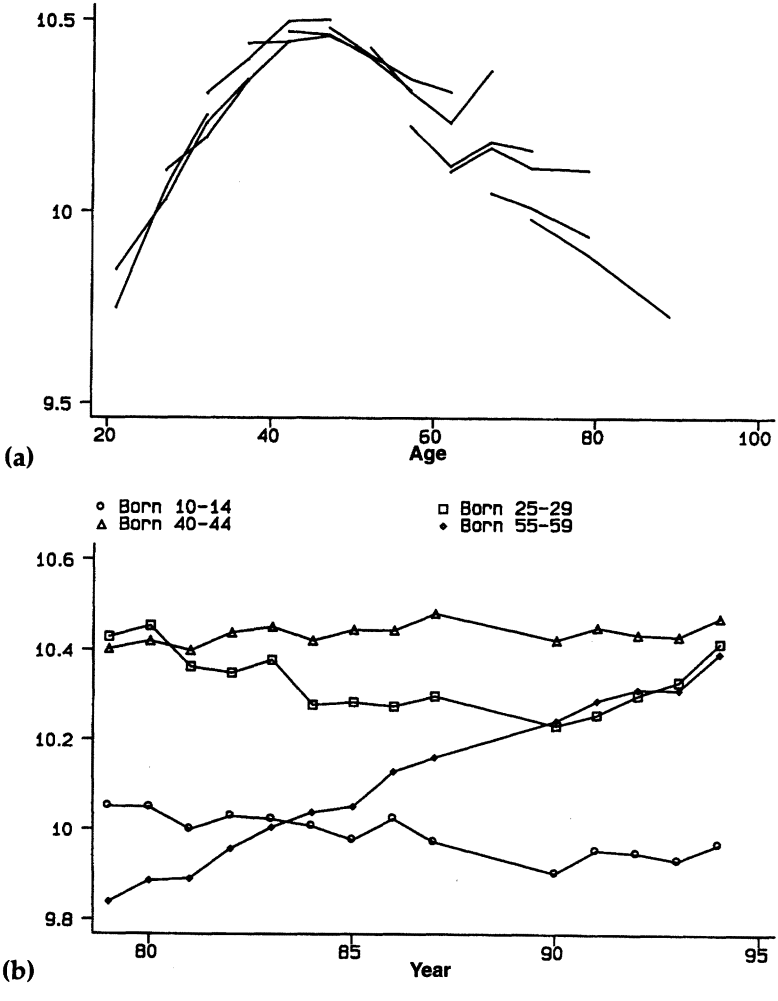
Figure 5a and b show the total consumption of each cohort divided by

but fewer than 50 in each year of the 1990s. These partial cohorts are used only in a subset of the analysis, and when this is done it is noted.

33. This pattern has many interpretations and has been the subject of much debate; see for example Carroll and Summers (1991), Attanasio and Browning (1995), and Gourinchas and Parker (1997).

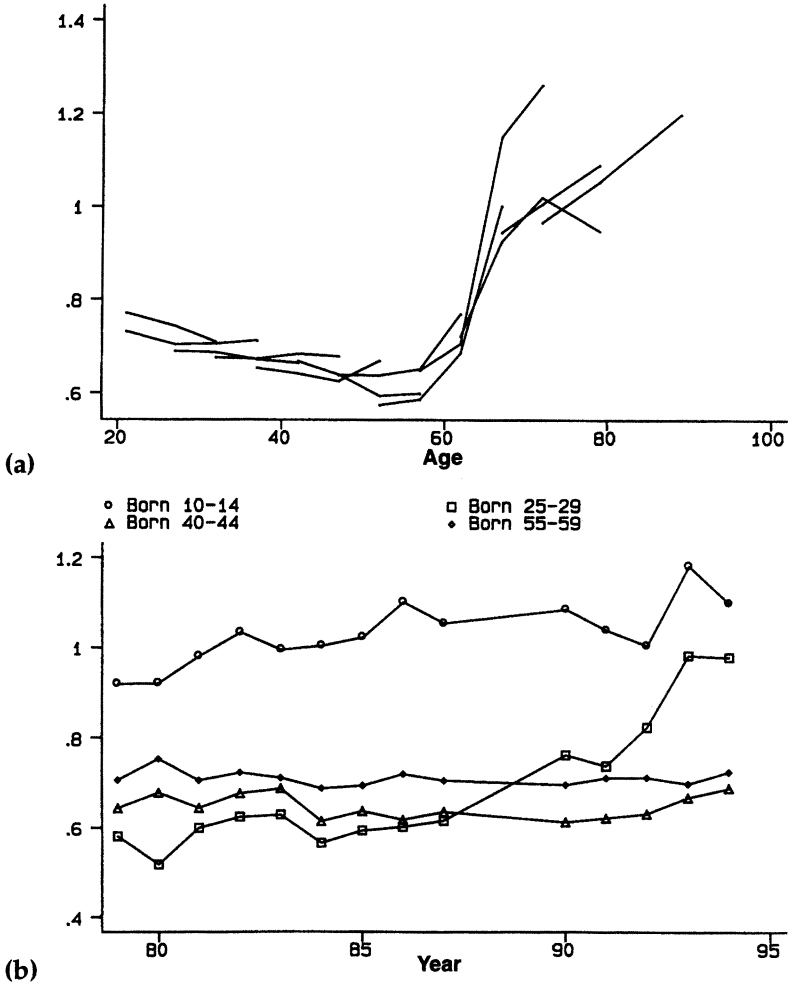
34. In the analysis of consumption levels, this feature of the imputation only biases the estimated age effects. In the growth-rate regressions, the artificial consumption growth over these years is removed by a dummy variable.

Figure 4 LOG NONDURABLES CONSUMPTION (a) BY AGE AND COHORT, (b) BY YEAR AND COHORT



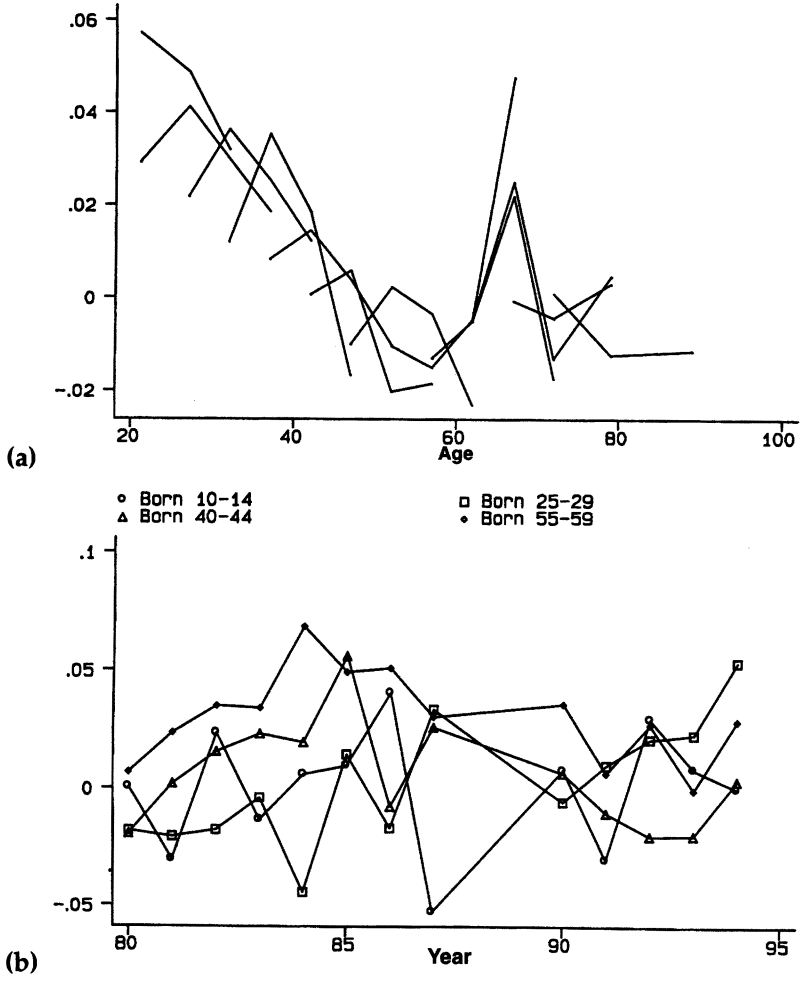
the total income received by that cohort by age and time respectively. Figure 5a emphasizes the clear life-cycle pattern of consumption ratios, in which the young save and the elderly dissave. Again these patterns are confounded by the inability to see people of different cohorts at the same age and in the same year. Looking at the general shape of the profile, one sees a mixture of effects at work. That is, since the profiles for different cohorts nearly join neatly or overlap when observed at the

Figure 5 NONDURABLES CONSUMPTION TO INCOME RATIOS (a) BY AGE AND COHORT, (b) BY YEAR AND COHORT



same ages, it may seem that the effect of cohort on saving behavior is small. In fact, however, these profiles may not join or overlap if time effects are removed. Figure 5b displays the combination of the effects of age and time on each cohort of households. The cohort born between 1925 and 1929 clearly has the sharpest rise in consumption ratio over the period; however, the same caveat that applies to the increasing consumption of the young applies here. During the 16-year period examined, the

Figure 6 LOG NONDURABLES-CONSUMPTION GROWTH (a) BY AGE AND COHORT, (b) BY YEAR AND COHORT



youngest households in this cohort age from 50 to 65 and the oldest households in this cohort move from 54 to 69. Thus, life-cycle considerations suggest that this group should move from saving to dissaving.

Finally, Figure 6a and b display the profiles of the average of household-level consumption growth. As is typical of household data, the growth rates of consumption display a fair amount of variation, but the life-cycle figure still captures a broad age pattern in the same way as

Figures 4a and 5a.[35] Household-level variation is potentially useful for identification of the underlying causes of the consumption boom. The profiles by time seem to have more measurement error, although the data do pick up the aggregate growth following the 1982 recession and the decline in consumption growth in the 1991 recession.

6.2 IDENTIFYING THE EFFECT OF DEMOGRAPHICS

In this section, each household's consumption and income is decomposed into a portion specific to the time period, a portion specific to its birth cohort, a portion specific to its age, and a final portion specific to the individual household. By defining the household-specific portion to have mean zero for each age, cohort, and time grouping, the aggregate consumption ratio can be reconstructed from a weighted combination of age, time, and cohort components for each time period. Separately identifying age, cohort and time effects requires an identifying assumption.[36]

The canonical methodology for separately identifying the effects of age, cohort, and time in saving-rate data is to assume either that time effects are unimportant or that they have mean zero and are orthogonal to a time trend (Attanasio, 1997a; Deaton and Paxson, 1994). Income and consumption are composed of four additive effects: a time effect specific to the year the household is observed; a cohort effect that captures permanent differences in wealth and situation; an age effect that captures the typical household's saving profile over their life; and finally a household-specific component, uncorrelated with the first three. In the absence of fluctuations, the stripped-down life-cycle model of Modigliani and Brumberg (1956) predicts identical age profiles for each generation and cohort effects that depend on lifetime resources. Attanasio (1997a) and Paxson (1996) provide evidence that age profiles over long time horizons conform reasonably well to this model.

I assume that the time effects have mean zero and are orthogonal to a linear time trend. The consumption increase can then be traced only to differential saving behavior of different generations or to different shares of the population at different ages. While this decomposition is informative without yielding a direct structural interpretation, a simple life-cycle

35. An alternative approach would be to average consumption by year and group first, and then to first-difference. But the amount of noise in household-level consumption growth does not seem to be sufficient to require that one look only at consumption growth by group.

36. Smoothing the data using age and cohort groups can provide an artificial identification. To avoid this, all members of a cohort are assigned to the same age, so that age = year − cohort, and the identification of the linear relationship among the effects requires an identifying assumption. The results, once identification is imposed, are substantively unchanged by this modification.

model predicts these effects. In the basic life-cycle model, the household consumption ratio, C/Y, can be written as the marginal propensity to consume at that age times the household's wealth:

$$\frac{C_h}{Y_h} = \mathrm{MPC}_a \frac{\mathrm{NPVY}_h + W_h + \mathrm{NT}_h}{Y_h}, \tag{6.1}$$

where NPVY denotes the net present value of human wealth, MPC denotes the propensity to consume out of total resources, h denotes the household in question, a denotes age, W denotes financial wealth, and NT denotes the present value of net transfers. All wealth measures are as of the start of life. The marginal propensity to consume out of wealth is allowed to vary by age, presumably due to changing family size, time until death, and possibly changing preferences (or even unmodelled precautionary saving).

Taking logs yields

$$\ln \frac{C_h}{Y_h} = \ln \mathrm{MPC}_a + \ln (\mathrm{NPVY}_h + W_h + \mathrm{NT}_h) - \ln Y_{h,t}.$$

So that the aggregate consumption-to-income ratio can be exactly reconstructed after the decomposition, I employ the approximation $\ln(C_h/Y_h) \approx -S_h/Y_h = C_h/Y_h - 1$, leading to

$$\frac{C_h}{Y_h} = A_h + B_h + T_h + \epsilon_h, \tag{6.2}$$

where $A_h \equiv 1 + \ln \mathrm{MPC}_a$ plus the sample average of C/Y, B_h is the average of ln (NPVY + W + NT) across households in the same cohort as h less the sample average, T_h is the average of $-\ln Y_{h,t}$ across households in the same year as h less the sample average, and finally ϵ_h is that share of the consumption ratio not explained by the three effects. Under certainty, the cohort effect depends only on lifetime resources. Fluctuations in income deliver time effects. Note that in estimation, sampling error falls naturally into a time effect.[37]

Before decomposing the ratio of consumption to income as shown in equation (6.2), I decompose household consumption into age, cohort, and time effects. Household consumption is regressed on a complete set

37. The existing models that yield time, age, cohort decompositions maintain the dual assumptions of certainty and a constant real interest rate.

of age dummies, a set of time dummies less two, and a complete set of cohort dummies less one. Cell weights are used in the regressions so that the relative importance of a given cell in generating the aggregate is accounted for. The regression constrains the coefficients on the time dummies to sum to zero and to be orthogonal to a time trend. The coefficients on the cohort dummies are constrained to have mean zero.

Figure 7a shows the decomposition of household-level consumption. The age profile of consumption rises with age and declines less than the rough profile of Figure 4. This difference is due to the cohort effects that steadily increase over the century. Each successive cohort consumes more, presumably because its lifetime resources are greater.[38]

Figure 7b shows the same decomposition applied to the consumption ratio, as in equation (6.2). Consumption and income are separately constructed for each cell of cohort, age, and year, and the consumption rate is constructed for each cell by dividing total consumption by income.[39] The age effects in consumption ratios show a typical profile of nondurable and service consumption rates for any generation. Households during their working lives consume less than their incomes, and a roughly constant fraction of income as they age. As income declines at age 60 and during retirement, households consume significantly more than their incomes. The implied saving profile looks quite similar to the predictions of the textbook life-cycle model.

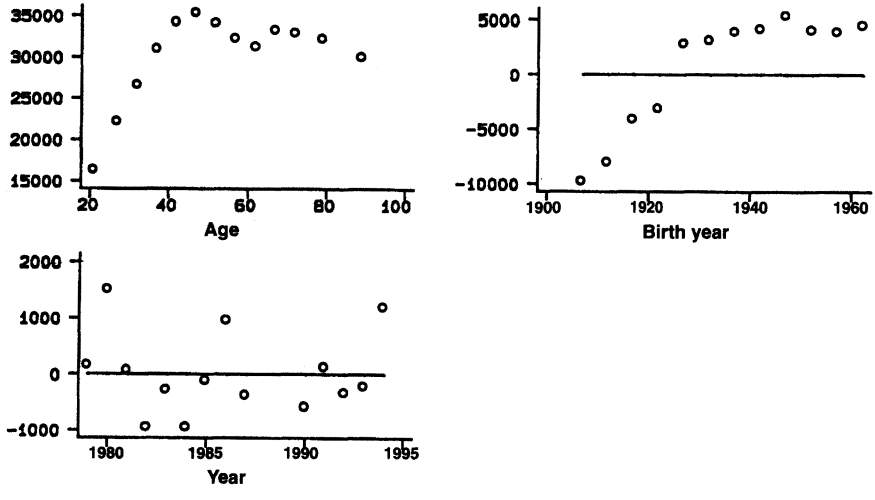
Turning next to the cohort effects, there is clear evidence that the younger cohorts are bigger spenders than the older cohorts, relative to their incomes. The effect is large, with the cohorts born most recently on average consuming over 15% more of their income than the oldest households. What causes such large differences? Within the framework of the simple life-cycle model above, this higher level of consumption comes from younger cohorts having higher wealth relative to income, such as from net government transfers or bequests.

The role of increases in wealth will be evaluated shortly. The role of intergenerational transfers is studied closely by Gokhale, Kotlikoff, and Sabelhaus (1996), who construct certainty-equivalent wealth levels in a life-cycle model and examine saving rates from 1963 to 1989. Their decomposition blames the declining national saving on government transfers to households that are elderly by 1989. If the pattern observed in Figure 7b were due only to intergenerational transfers, the net transfers to the youngest cohorts would have to be larger than those to the older cohorts. This is somewhat implausible and inconsistent with the

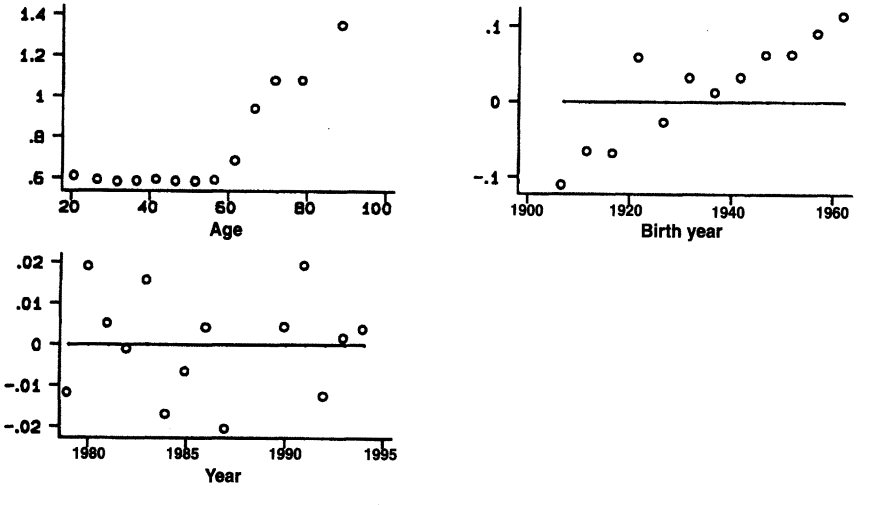
38. The rate of increase of the cohort effects clearly slows over time, consistent with the slowing of productivity growth.

39. Similar conclusions are reached on employing separate identification of effects in consumption and income at the household level.

Figure 7 (a) NONDURABLES-CONSUMPTION EFFECTS;
(b) NONDURABLES-CONSUMPTION-TO-INCOME EFFECTS



(a)



(b)

intergenerational transfer distributions constructed by Gokhale, Kotlikoff, and Sabelhaus (1996).

In sum, within the context of a basic life-cycle model, fiscal transfers across generations alone cannot explain the consumption boom. Transfers may be leading today's elderly to consume a larger share of their incomes than the elderly of two decades ago. But social security cannot explain the propensity of cohorts born more recently to consume a higher fraction of their incomes than the current elderly.

6.3 CAN CHANGING DEMOGRAPHICS EXPLAIN THE CONSUMPTION BOOM?

This subsection demonstrates that the changing distribution across age groups in the United States does not explain the increase in the ratio of consumption to income. According to the decomposition of Section 6.2, there are two possible explanations of the decline in saving. First, the weight given to different age effects may change as the shares of different age groups in the population change. For example, as the elderly have become an increasing share of the population, they may have pushed the aggregate saving rate down because the elderly consume a larger fraction of their incomes than other age groups. Second, the cohorts that are higher consumers may move to the ages at which their consumption and incomes are higher and so push up the aggregate consumption rate. Lower-consumption cohorts may also die and be replaced by higher-consumption cohorts.

This subsection uses the estimated effects to consider partial-equilibrium alternative scenarios in which different weights are given to different effects in generating the aggregate consumption ratio. The aggregate consumption-to-income ratio for each year, denoted $\widehat{\left(\frac{C}{Y}\right)}_t$, can be reconstructed as

$$\widehat{\left(\frac{C}{Y}\right)}_t \equiv \frac{\Sigma_{i \in I_t} w_i \hat{B}_i}{\Sigma_{i \in I_t} w_i} + \hat{T}_t + \frac{\Sigma_{i \in I_t} w_i \hat{A}_i}{\Sigma_{i \in I_t} w_i},$$

where i indexes age–cohort–year cells, I_t is the set of cells for which the year is equal to t, w_i is the population weight associated with that cell, $\hat{B}_i$ is the estimated birth-year or cohort effect, $\hat{T}_i$ is the estimated year effect, and $\hat{A}_i$ is the estimated age effect.

Figure 8a displays the reconstructed consumption-to-income ratio without cohort effects.[40] Figure 8b shows the consumption ratio with age

40. This analysis is conducted including the partial cohorts so as to replicate the aggregate time series. This reconstructed consumption ratio has a slightly lower increase over the

and time removed, leaving only the effect of cohorts aging. These figures show that the consumption boom is not due to the changing age distribution. Instead, the decline in saving occurred because each successive generation consumed more of its income than the previous generation at that age.[41]

This conclusion matches the general consensus of research in this area that the age distribution of the population has little effect on national saving (Bosworth, Burtless, and Sabelhaus, 1991; Paxson, 1996; Attanasio, 1997a; Deaton, 1997). All of these papers employ slightly different methodologies and data, and all blame cohort rather than age effects for declining saving rates. Attanasio (1997a) finds that those born between 1925 and 1939 account for an unusually high share of national consumption. Gokhale, Kotlikoff, and Sabelhaus (1996) attribute the decline in saving between 1960 and 1990 to the large share of resources flowing from future generations to the generation that is currently elderly.[42] The findings of the remaining sections of the present paper concur that age dynamics have little to no effect on the consumption ratio.

The balance of this paper is devoted to a fuller investigation of the structural interpretation of these all-important cohort effects. In this section, the cohort effects represent differences in lifetime resources, because the environment is assumed so simple that no other explanations are present to compete. There are two reasons to be skeptical of such a simple interpretation. First, the observed pattern of fiscal transfers is not consistent with the estimated pattern of the cohort effects. Second, there are important observed changes in the U.S. economy that call into question the simple identification scheme of this section. Differences in real interest rates, shocks to wealth, and different rates of time preference across generations all invalidate the identification assumptions employed here by altering the age profile of consumption across households.

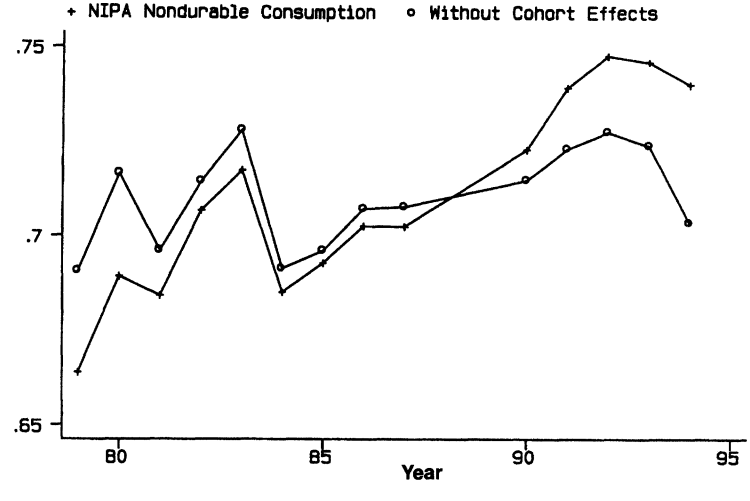
To address these shortcomings, the next section augments the simple life-cycle decomposition. I allow for uncertainty and model the cohort effect as due both to the permanent component of income and to wealth holdings. Estimating a linear approximation to the household

period than the raw data, which implies that the true cohort effects for the extremely old and young are larger in absolute value than the endpoints that are used for them. Also, the changing numbers of these households over time induce some year-to-year fluctuations in the reconstructed ratio that are not due to time effects.

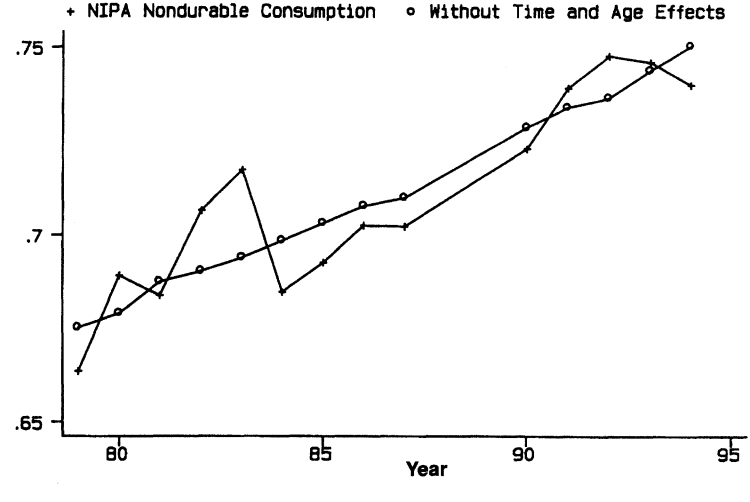
41. The same conclusion and similar pictures are obtained if instead I separately remove cohort effects from consumption and income at the household-level and reconstruct time series without cohort effects in either series.

42. They attribute about half of the increase in consumption to an increasing propensity of the elderly to consume, a propensity that is not identified as due to age, cohort, or time.

Figure 8 (a) NONDURABLES-CONSUMPTION RATIO AND COHORT EFFECTS; (b) NONDURABLES-CONSUMPTION RATIO WITHOUT TIME AND AGE EFFECTS



(a)



(b)

consumption policy function, I again find that the appreciation of assets alone cannot explain the consumption boom.

7. *The Role of Wealth*

This section considers a realistic but simple model of household behavior and estimates an approximate consumption policy function for each

household.[43] The procedure of this section does not assume that time effects have mean zero or that the agent's environment is certain. The consumption boom is traced to the changing age distribution, time effects, and the changing distributions of wealth and the permanent component of income.

7.1 AN ORGANIZING MODEL

Each household in the economy chooses consumption to maximize expected lifetime utility:

$$\text{Max } E_s\left(\sum_{t=s}^{T} \beta^{t-s}\nu_a u(\Gamma_t, C_t)+\beta^{T+1-s}V^D_{T+1}(\Gamma_{T+1}, X_{T+1})\right),$$

where E_s is the expectation operator conditional on all information available at time s, β is the discount factor, v shifts utility as households age, Γ is a family-size adjustment that normalizes consumption to per capita terms, X_t is household cash on hand, and $V^D(\cdot)$ captures the possible value of cash on hand remaining at death. Household choices are constrained by an intertemporal budget constraint that represents the evolution of liquid assets or cash on hand, X_t, and a liquidity constraint that they must maintain positive net wealth:

$$X_{t+1} = \tilde{R}_{t+1}(X_t - C_t) + (1 - \tau)\, Y_{t+1},$$
$$X_t \geq C_t,$$

where $\tilde{R}_{t+1}$ is the gross after-tax rate of return on the household's optimal portfolio, and Y_t is disposable nonasset, pretax income.

The household bases its consumption upon its current state and its expectations about the future. That is, household consumption is described by an optimal policy function of the payoff-relevant state variables. In order to choose its current consumption level, the household needs to know its current and expected future resources, its family size, the time horizon over which it is alive, and the possible investments and rates of return available to it. In order to forecast future income, I assume that the household only requires the permanent component of its income, P_h, the aggregate state, A_t, and its age.[44] I assume that the household requires only knowledge of the aggregate state to forecast future rates of return optimally.

Under these assumptions, the consumption function for household h

43. Recent work that estimates consumption functions includes Carroll (1994) and Parker (1998).

44. The permanent component will be defined shortly. I will also consider a case in which current income is necessary for predicting future income.

can be written solely as a function of family size, wealth, income, age, the permanent component of income, and the aggregate state.

$$C_h = F(\Gamma_h, X_h, \text{age}_h, P_h, A_t). \tag{7.1}$$

Since different cohorts may still have different preferences for consumption above and beyond their state variables, and since there may be a role for different intergenerational transfers by cohort, the exclusion of birth year from the consumption function is tested.

7.2 ESTIMATION STRATEGY

A log-linear approximation to the policy function is estimated in the form

$$\ln C_h = g(\Gamma_h) + h(X_h) + f(\text{age}_h) + B \ln P_h + T_t + \epsilon_h, \tag{7.2}$$

where the residual represents measurement error in the level of consumption, and T_t is a year effect that captures the aggregate state, that is, changing expectations about the future. This equation is estimated on the PSID data in 1984, 1989, and 1994, the years in which, as previously discussed, the PSID has an accurate reporting of household wealth. The data are constructed from the PSID data already employed, with the addition of these three years' wealth supplements and the following two constructions.

First, I construct a measure of consumption in 1989, a year in which the PSID does not report food consumption. Consumption from 1990 is used instead and deflated for each household by the aggregate growth in consumption between 1989 and 1990. Since any innovation to marginal utility between 1989 and 1990 should not be predictable by anything known in 1989 (such as what is on the right-hand side of the 1989 regression), this substitution should not adversely affect the results. Second, I construct the permanent component of income as the forecast of the log of current income from two lags of the log of family income, education, and age-group dummy variables. This forecast is done separately for retired and nonretired households. Note that to the extent that permanent income is mismeasured, some of its effect on consumption will be picked up by correlated variables such as wealth. Given a positive correlation between true permanent income and wealth, such mismeasurement would lead to an exaggeration of the impact of wealth on consumption.

The function $g(\Gamma_h)$ consists of the size of the family and the number of children in the family. A set of dummy variables representing the five-year age groupings capture the age effects on consumption, $f(\text{age}_h)$. Fi-

nally, wealth is included in the regressions as the log of wealth if it is positive, a dummy for wealth being zero or negative, and a dummy for whether the household has a pension.

How does this model differ from the age–time–cohort decomposition of the previous section? The key differences are two. First, the model includes directly both wealth and the permanent component of income in place of the cohort effect of the previous section. The behavior of consumption can then be traced both to this observable version of the cohort effect and to time effects and omitted elements of the cohort effect. Second, the time effects are not constrained to be orthogonal to a linear trend. Thus they can explain trend movements in consumption that are not explained by increases in wealth, the changing age distribution, and so forth.

Equation (7.2) is estimated on the entire sample of weighted data with imputed real nondurable and services consumption as the dependent variable. The time effects capture expectations, real interest rates, and all aggregate conditions. The only source of variation is cross-sectional. The goal of the exercise is to see whether the behavioral relationships estimated from household data can explain the consumption boom when time-series variation is substituted for cross-sectional variation.

7.3 BEHAVIORAL EVIDENCE ON THE CONSUMPTION BOOM

Table 3 displays the results of estimation of four different specifications and the implied increases in the ratio of consumption to income due only to changes in the distribution of wealth to income over the period.[45]

The marginal propensity to consume out of wealth is estimated to be around 4%. As noted in Section 3, ignoring timing, a marginal propensity to consume out of wealth of 9% can rationalize the entire 20-year consumption boom. Over the 10-year period being studied here, however, wealth increased in relation to income only over the first 5 years; during the second 5 years the distribution of wealth spread out, so that the number of low-wealth households increased despite no significant change in the mean wealth-to-income ratio.

The estimated relationship between consumption and wealth is not linear, in that the cluster of low-wealth households have more consumption than would be implied by the relationship between wealth and consumption for higher-wealth households. The PSID does not measure pension wealth, but the presence of a pension increases consumption by between $2\frac{1}{2}\%$ and 5%.

When interpreting the income variables—the current income and the

45. See Hurst, Luoh, and Stafford (1998) for a detailed description and analysis of the distribution of wealth in the PSID. See also Sabelhaus and Pence (1998) on the changing wealth distribution.

Table 3 CONSUMPTION-FUNCTION REGRESSIONS

Regression	*1*	*2*	*3*	*4*
Log of wealth (if not low)	0.048	0.039	0.045	0.036
	(0.002)	(0.002)	(0.002)	(0.002)
Low wealth	0.330	0.267	0.301	0.248
	(0.025)	(0.023)	(0.025)	(0.024)
Expected log income	0.314	0.175	0.309	0.172
	(0.005)	(0.006)	(0.006)	(0.007)
Pension	0.049	0.028	0.047	0.027
	(0.007)	(0.007)	(0.007)	(0.007)
Log income		0.161		0.160
		(0.005)		(0.005)
Stockholder			0.041	0.028
			(0.008)	(0.007)
Year 1989	0.030	0.030	0.028	0.029
	(0.008)	(0.007)	(0.008)	(0.007)
Year 1994	0.053	0.059	0.048	0.056
	(0.008)	(0.008)	(0.008)	(0.008)
Number of observations	11,903	11,903	11,901	11,901
R^2	0.583	0.623	0.584	0.624
Significance level for birth year	0.953	0.908	0.955	0.909
Implied increase in C/Y due to increase in W/Y:				
1984–89	0.011	0.009	0.010	0.008
1989–94	0.003	0.002	0.002	0.002
Total increase in C/Y				
1984–89	0.025	0.025	0.025	0.025
1989–94	0.030	0.030	0.030	0.030

Regressions also include family size and the number of children in the household and a complete set of age-group effects. Standard errors are in parentheses.

permanent-component or expected income—one must keep in mind that the time effects remove mean long-run correlations. That is, if the model were identified from the time dimension, then rising incomes and consumption together with the budget constraint would impose a cointegrating relationship. This is not the case in cross-sectional data, a point made famously by Milton Friedman. Even looking at predicted

income, the coefficient is far from unity, suggesting only a 30% increase in consumption with income.[46]

The increase in wealth-to-income ratio explains, again in a partial-equilibrium sense, about a fifth of the increase in the ratio of consumption to income over the period. The implied increase in consumption due to the changes in wealth-to-income ratio is calculated as follows. The consumption-to-income ratio that actually occurred is compared with the consumption-to-income ratio calculated from the estimated parameters and an unchanging distribution of wealth-to-income ratio.[47] By estimating the consumption function rather than looking for evidence in Euler equations or contemporaneous relationships, this analysis exploits the long-term relationships between the variables. Thus it finds a significant effect of stock-market activity on consumption, where many studies before, focusing on high-frequency data, have found little relation.[48]

In addition to a role for wealth, the regressions in Table 3 find a significant role for both time and birth-year effects. First, the majority of the increase in the ratio of consumption to income is due to time effects.[49] This is consistent with the optimism explanation for the consumption boom, in which households believe that future output less government consumption will rise significantly. However, the null hypothesis that birth year does not belong in the regression model is rejected at the 10% level across all specifications. Thus, the wealth variable is not sufficient to capture all the cohort effects that are present in the data. The large share of the decline in saving that cannot be explained by the wealth distribution is instead explained by some combination of time effects and unmodeled cohort effects. We can conclude that neither the increase in wealth nor the changing distribution of the population can fully account for the consumption boom.

The third and fourth regressions investigate the role of stock-market participation. If some households are exogenously barred from investing in the stock market, then the consumption of households that are in the market should be higher than that of those that are out of the market, given the value of the set of state variables for that household.[50] This

46. It is most likely that this signals persistence but not permanence in the expected/permanent component of income.
47. The change in the log of wealth less the change in the log of income is multiplied by the estimated coefficient on the log of wealth and added to the change in the fraction of low-wealth households times the coefficient on low wealth.
48. See Poterba and Samwick (1995), Ludvigson and Steindel (1999), and the citation therein.
49. Changes in the age distribution contribute a small decrease in the consumption-to-income ratio.
50. The household that is not excluded can always mimic the excluded household and do at least as well.

might be the case if, for example, poor households do not find it worthwhile to pay a fixed cost that is required for access to the stock market.[51] Table 3 estimates that the benefits to participation are quite small, on the order of 3–4% of consumption. Given that the share of households in the stock market has risen by about 10% over the period studied, a partial-equilibrium model would predict a $\frac{1}{3}$% rise in consumption from increased stock-market participation. Of course, in general equilibrium, prices respond. The increased participation affects asset prices and so the wealth of those already in the market; the expectation of entering the market has effects on those not in the market; and in addition, endogenous changes in the capital stock affect all workers. From this analysis, one can only conclude that there are small but significant increases in consumption from stock-market participation above and beyond wealth-holding, income, age, and the aggregate state.

In sum, this section finds a significant but small role for the appreciation of assets in the consumption boom: the increase in wealth that occurred from 1984 to 1994 increased the consumption ratio by one-fifth of its overall increase. The remaining causes of the consumption boom are due to other time and cohort effects, but not due to the changing age distribution of the population.

The next section studies the growth rate of consumption and models all time effects as due to the real interest rate or shocks to wealth.

8. *Consumption Growth: Impatient Generations, Wealth Increases, and Intertemporal Substitution*

This section analyzes the growth rate of consumption instead of its level. The advantages of this approach are threefold. First, the real interest rate and thus intertemporal substitution is modelled structurally. Second, the growth rate of consumption is related to wealth measures in order to evaluate whether unexpectedly high asset returns are the cause of the consumption boom. If a series of unexpectedly high stock-market returns have increased consumption significantly, the households that own stocks should have significantly higher consumption growth than those that do not. Third, the role of some preference heterogeneity is modelled by allowing different cohorts to have different discount rates.[52] To preview the findings, there is no evidence uncovered that wealthy

51. See Vissing-Jørgensen (1998).

52. In the levels analysis, if discount rates were heterogeneous, then the age profiles of consumption would vary with cohort and this variation would undermine the identification employed in Section 6.

households had faster consumption growth or that younger cohorts have higher discount rates.

Analysis of growth rates cannot replace examination of consumption levels for two reasons. First, growth rates of consumption at the household level are extremely variable, which weakens statistical inference. Second, household transitions like divorce, marriage, death, and leaving home imply that the analysis misses significant parts of consumption growth. For example, if young cohorts start life with high consumption and then have consumption growth over their lives that is similar to that of older cohorts, consumption growth aggregated from household consumption growth will show no consumption boom or cohort heterogeneity. The level and the growth-rate analyses are complementary.

Before presenting the analysis, it is important to note that there is a consumption boom in the first-differenced data.[53] However, for the analysis of consumption growth rates, a modified method is used to impute consumption in the PSID, as described in the Appendix. This imputation assigns NIPA consumption so that the aggregated household data match NIPA growth in real per capita consumption. The imputation does not alter the cross-sectional pattern of consumption growth, so that, for example, if stockholders have faster consumption growth than nonstockholders over the period, this will still be detected. This imputation mainly smooths out the swings in growth that occur from year to year due to sampling and measurement error.

The expected real interest rate is constructed from the after-tax nominal return on a six-year Treasury bill during the calendar year of the interview less the inflation rate calculated from the chained deflator for nondurable goods and services that is used to deflate the rest of the data. The marginal tax rate is taken from Stephenson (1998) (the series AMEITRPI).[54] The expectation is taken by predicting the real interest rate for year t (to be used as the return between t and $t + 1$) using the following variables: the once lagged second-quarter to second-quarter growth rate in national income; the twice lagged after-tax real interest rate; the once and twice lagged annual unemployment rate for white males 20 years of age and older.[55] The predicting equation is run for the period 1962 to 1997.

Finally, two steps are taken to minimize the effect of the high level of

53. See Appendix (Figure 10) and Figure 6b.

54. Using the real return on high-grade municipals which are tax-free leads to the same conclusions throughout, since the expected returns of these annual series are highly correlated.

55. The consumption data in the PSID refer to a specific point in time, and are not averages over a calendar year, although there is some debate on this point (see the appendix of Zeldes, 1989).

noise in consumption growth data.[56] First, the groupings of age and cohort are expanded to ten-year groups. The noise in consumption growth makes the identification of age and cohort groups more difficult, and the five-year groups were substantially noisier.[57] Second, changes greater than 75% in absolute value are dropped.

Identification is slightly simpler in the growth-rate regressions. In theory, the innovations in the Euler equation have mean zero and are not predictable by the other right-hand-side variables. In other words, the real interest rate captures all time effects that are not orthogonal to cohort and age effects and to the real interest rate.

However, one of the main explanations of the consumption boom is that there has been a sequence of positive shocks to wealth. Thus, as a second assumption, time effects aside from the real interest rate are allowed to differ by household wealthholding patterns. That is, the weakness of the first assumption is that innovations to wealth might be correlated with predictable movements in the real interest rate in a short panel of data. Suppose that the period from 1984 to 1994 experienced a run of innovations to wealth, due to unexpectedly strong stock-market growth. There would be increases in consumption over the period that would not have mean zero after removing the substitution effect due to movements in the real interest rate. The coefficients on the remaining regressors would suffer from a small-sample bias. To allow for this possibility, I identify the trend in cohort and age effects of all households using the nonstockholders or low-wealth households according to the first identifying assumption, and then allow the time effects or trend consumption growth rate of stockholders or high-wealth households to be different. This is done by adding a dummy variable for stockholding or the log of wealth to the Euler equation to capture the mean of the expectation errors for these households in sample.

Table 4 shows the results of estimating the following consumption Euler equation.[58]

$$\Delta \ln C_{h,t+1} = \sigma E_t[r_{t+1}] + \text{age}_{h,t} + \text{cohort}_{h,t} + \eta_{h,t+1},$$

where σ is the intertemporal elasticity of substitution. The regressions explain just over 1% of the variation of household consumption growth.

56. The same set of regressions are run in grouped data, since the measurement error is reduced by averaging, but exogenous variation is also averaged and the results are quite similar to those presented here.
57. Put another way, the groupings are informally imposing a smoothness prior on the data. Large amounts of variation across neighboring groups suggest insufficient smoothing.
58. Estimation employs two-stage least squares, and reported standard errors allow for correlation across households within a time period by including time effects.

Table 4 CONSUMPTION GROWTH REGRESSIONS

Regression	*1*	*2*	*3*
Expected real interest rate	0.700	0.729	0.730
	(0.120)	(0.125)	(0.125)
Cohort <09	−0.006	−0.006	−0.005
	(1.259)	(1.308)	(1.309)
Cohort 10–19	0.006	0.010	0.010
	(1.178)	(1.223)	(1.224)
Cohort 20–29	−0.009	−0.005	−0.005
	(1.065)	(1.104)	(1.105)
Cohort 30–39	−0.013	−0.011	−0.011
	(0.918)	(0.952)	(0.953)
Cohort 40–49	−0.009	−0.009	−0.009
	(0.791)	(0.825)	(0.826)
Cohort 50–59	−0.007	−0.008	−0.008
	(0.577)	(0.599)	(0.600)
Log (wealth)/100 (if not low)		−0.076	−0.096
		(0.320)	(0.433)
Stockholder		0.000	0.000
		(0.023)	(0.023)
Pension		0.003	0.003
		(0.032)	(0.032)
Homeowner			0.003
			(0.040)

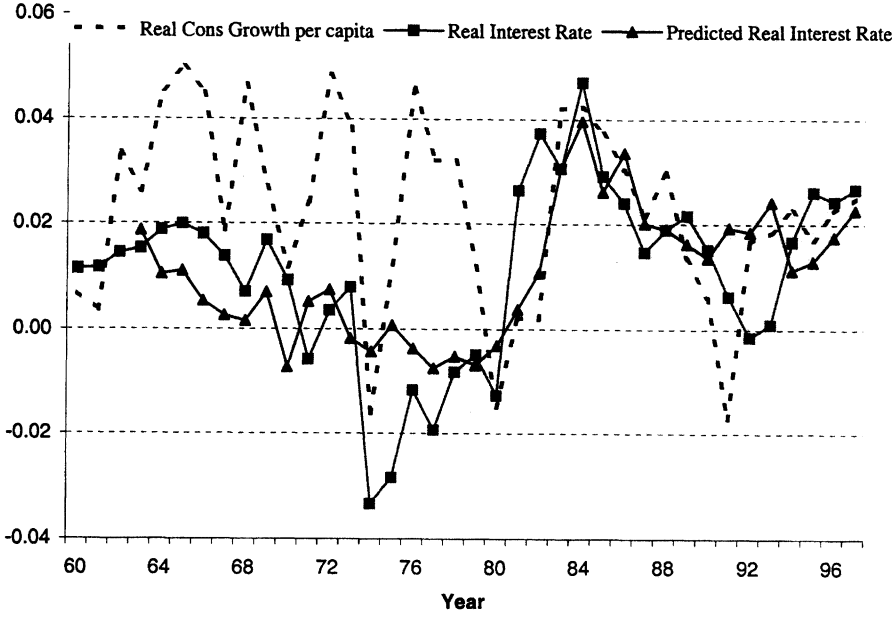
Dependent variable is the first difference of log consumption. Regressions also include a complete set of age-group effects. Standard errors are in parentheses.

The first column of Table 4 presents the regression results for a standard Euler equation.

The first result of interest is that the intertemporal elasticity of substitution is estimated as 0.7. Typical estimates in the literature are significantly lower and sometimes zero.[59] This estimate is in line with Attanasio and Weber (1995), who used grouped CEX data to study Euler equations over the same period. The reasons for this finding here are three. First, consumption of nondurable goods and services typically has a higher elasticity than food. Second, the data are annual. If seasonal fluctuations in consumption and the real interest rate are to some extent driven by preferences, this confounds inference. Finally, for the decade covered by the

59. See the discussion in Deaton (1992).

Figure 9 INTEREST RATES AND GROWTH IN REAL CONSUMPTION PER CAPITA



household data, consumption growth and the expected real interest rate are highly correlated.

Figure 9 displays the expected real interest rate and the growth rate of real consumption per capita. Over the past twenty years, the changes in the growth rate of consumption can be rationalized by movements in the expected real interest rate assuming an intertemporal elasticity of substitution near unity. As to explaining the consumption boom, one can ask to what extent consumption growth would have been slower had a lower real interest rate been in effect.[60] The expected real interest rate from 1980 to 1994 averaged 1.5%. During the last five years the expected rate has averaged just over 1%. Given the estimated elasticity of intertemporal substitution, consumption growth would have been 0.35% per year slower had this lower interest rate been in effect. Over the 15 years of data on which the coefficient is estimated, consumption grew 5.5 percentage points more than income, and this alternative scenario generates nearly exactly that excess.

60. There would of course be an associated jump in consumption with an announced different path of interest rates, so this counterfactual is asking whether the observed consumption growth can be rationalized by the substitution effect alone.

There are three main problems with explaining the decline in saving solely by intertemporal substitution. First, the nice fit of the Euler equation, observed roughly since Hall (1978) pointed the equation out, is not evident in the earlier data.[61] Expected income growth may be partly generating this high estimate of the intertemporal elasticity of substitution during the consumption boom. During the 1980s and 1990s, there is a strong correlation between expected income growth and the expected real interest rate.[62] Second, from 1960 to 1979, the real rate of return averaged 0.02%, and as shown in Table 1, the growth rate of real consumption per capita averaged 2.5%. That is, across the decades, high real interest rates are correlated with low rates of consumption growth. Finally, it is difficult to take seriously a story in which almost none of the movements of consumption over 14 years are driven by changes that represent new information to households.

Despite this skepticism, it is important to note that the consumption and real-interest-rate data are consistent with the impulse response of a shock to household propensity to consume in the early 1980s.

Turning to the hypothesis that different cohorts have different discount rates, Table 4 demonstrates that the cohort effects on consumption growth are small and not significantly different from one another. While the standard errors are large, even in the point estimates, there is not evidence of greater impatience in younger cohorts. It is worth noting that the mean of the cohort dummies is not separately identified from the mean of age effects. Thus one cannot construct a hypothetical consumption path along the lines of Figure 8 without some further restrictions on the data.

The second and third columns of Table 4 show that consumption growth is not significantly higher for high-wealth households, homeowners, stockholders, or households with pensions.[63] Wealth is statistically insignificant in the last column, and the magnitude of the effect is small, suggesting a 0.1% lower rate of consumption growth for a doubling of wealth.[64]

61. The usual citations are Hansen and Singleton (1983), Hall (1988), Campbell and Mankiw (1989), and Blinder and Deaton (1985).
62. Janice Eberly and John Campbell both suggested that I include expected income growth in the consumption-growth regressions. Doing so does give a statistically significant role for expected income growth, but it is economically small and does not alter the coefficient on the expected real interest rate. Given the imputations made, this is not quite a fair test of the role of expected income, but there are many in the literature.
63. In regressions using wealth data that are only available in 1984, 1989, and 1994, the most recent predetermined value is used. When this is not available, 1984 data are used. Dropping all changes prior to 1984–1985 leads to the same conclusions.
64. While not consistent with the wealthy having more positive innovations to the marginal utility of wealth over this period, the result is consistent with the wealthy having lower precautionary saving motives.

One possible reason for the insignificant results in these growth-rate regressions is the presence of large amounts of measurement error in the growth rate of consumption. One solution, which comes at the cost of a representative sample, is to regress the growth of consumption in the five years following a wealth survey on the initial wealth levels and time effects and household characteristics such as family size and age, as is done for levels in the previous section. Doing this confirms two of the three main implications of the growth-rate regressions. First, cohorts cannot be ignored even after conditioning on the wealth characteristics of households, although it is still not possible to identify a clear pattern of differing discount rates across cohorts. Second, the wealthy are again found to have slightly lower consumption growth over this period. The final main point, which cannot be meaningfully confirmed with only two observations on consumption growth, is that consumption growth and the real interest rate move in lockstep.

In sum, how does the analysis of growth rates inform what was learned in the levels analysis? The real interest rate may have played a role, but only as it propagates a positive shock to the desire to consume out of output in the early 1980s. We still find no evidence that the consumption boom is due to wealth appreciation.

9 Conclusion

This paper is motivated by a striking increase in the share of U.S. output that is consumed. This increase has occurred concurrently with a reduction in the growth rate of consumption per capita, a high real interest rate, and an increasing ratio of wealth to income. In a search for clues, the paper uses a dataset of household consumption, income, and wealth to decompose the consumption boom and confirm or reject possible culprits.

This analysis leads to several conclusions about the large increase in the consumption share of output and the decline in the U.S. saving rate.

First, a thorough examination of NIPA data shows that households and governments in the United States are consuming a greater share of output than twenty years ago. Second, this increase is not due to the changing age distribution of the U.S. population.

Third, only one-fifth of the increase in consumption to income can be explained by changes in the ratio of household wealth to income. While the wealth-to-income ratio has risen, it has done so primarily after the increase in the consumption share of output. The national saving rate has actually risen coincident with the stock-market boom of the late 1990s. The propensity to consume out of wealth estimated from the house-

hold data cannot rationalize the consumption boom. The increases in consumption-to-income ratios across groups are not related to the distribution of wealth, homeownership, or pension participation. While surely they have a role, shocks to asset values are not the main force driving the relative increase in consumption.

Fourth, prime candidates for explaining the consumption boom are factors that increase the effective discount rate of the representative agent. During this period of rising consumption share, the growth rate of real consumption per capita has fallen. At the same time, real interest rates have been relatively high. These two facts together imply a driving force that has increased actual or effective discount rates. It is also worth noting that there is a strong correlation between the real interest rate and consumption growth within the period of consumption boom. That is, the aggregate consumption Euler equation provides a better description of the data during this period than in previous periods.

This paper considers several explanations that can generate this effective impatience. The analysis reveals no evidence that the growth rate of consumption, and thus the discount rate, is higher for younger households. Further, inconsistent with an explanation that relies only on intergenerational government transfers, younger cohorts have a higher ratio of consumption to income than older cohorts. Finally, relaxed liquidity constraints could lead to an increase in debt and consumption. But the total increase in debt relative to income over the past two decades only amounts to one-third of the value of the consumption boom.

While we do not yet have a clear answer to what has caused the recent decline in saving, some speculation is possible based on the concrete findings of this paper.

Given that consumption is a forward-looking variable, households may be learning about high levels of output in the future. This explanation is untestable, and twenty years is a long consumption boom without yet seeing a shift to higher output growth. However, given that other explanations have come up short, this possibility gains credence. The strength of this explanation is that we do observe some signals of high future growth rates, such as the increase in stock prices; the weakness is that without quite a run of negative expectational errors, this explanation cannot match the slowdown in consumption growth.

A second candidate is that rather than being driven by technology or a force external to U.S. households, the decline in saving is due to a shift in the preferences of the typical household. This explanation is as hard to evaluate as the optimism explanation just discussed; however, it can fit the facts uncovered here.

A final explanation consistent with the findings of this paper is a

combination of factors that work to increase the consumption of different generations. Perhaps federal transfers in the form of social security and Medicare are increasing the consumption of the elderly, while relaxed liquidity constraints are allowing the young to consume more of their incomes. This explanation can match the cross-cohort effects on the consumption-to-income ratio found in Section 6, the high real interest rate, and the slowdown in consumption growth; however, it is inconsistent with the stock-market boom.

There are many theories that can explain an increase in the consumption of aggregate output. This paper shows that the main monocausal explanations fail to match the household behavior or macroeconomic outcomes observed during the decline in U.S. saving over the past two decades. More importantly, we have an increasing number of facts that new theories or combinations of theories must fit.

Appendix. The Household Data

A.1 THE PANEL STUDY OF INCOME DYNAMICS

The main relevant features of the PSID are described in the body of the paper. Several remaining issues are noted here.

To ensure that the sample is nationally representative, the oversampled Latino subsample is excluded from analysis.

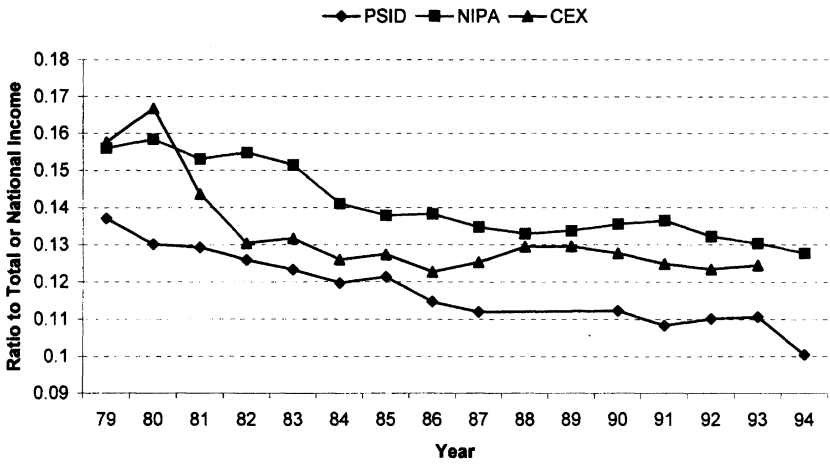
Figure 10 demonstrates that the ratio of total household food consumption to total household income in the PSID matches well the time-series pattern of the ratio of total food consumption to national income in the NIPA data. The PSID ratio is persistently lower by about $2\frac{1}{2}\%$ of income. This is because food consumption in the national accounts includes food purchases by employers and the government, because income in the PSID includes transfers, and because the PSID seems to underestimate total food consumption expenditures by households. This claim is verified by comparing the amounts inferred from the PSID and from the CEX.

The PSID total-wealth-to-income ratio matches the net-worth-to-income ratio in the flow-of-funds data well. Both ratios rise significantly from 1984 to 1989 and are roughly the same in 1989 and 1994.

A.2 THE CONSUMER EXPENDITURE SURVEY

This section evaluates the relevant features of the CEX data. In order to perform the imputation procedure, a household's consumption must be allocated to a quarter, and to evaluate the quality of the data, it must also be allocated to a year. A household's reported consumption expendi-

Figure 10 FOOD-CONSUMPTION-TO-INCOME RATIOS



tures are allocated to the calendar quarter closest to the midpoint of the year covered by interviews. Annual data are constructed for graphing by using the average of all quarters in that year.

Figure 10 shows that the ratio of food consumption to income in the CEX declines slightly more and has a slightly lower correlation with the NIPA series than the PSID series does. In fact, this large decline in the CEX is symptomatic of a poor correlation between the ratio of total consumption to income in the CEX and that in the NIPA. While this difference is in part due to increasing purchases of medical care by the government, it is also due to an increasing difficulty for the BLS in measuring certain categories of household consumption expenditures. It turns out that this does not create an insurmountable difficulty for the analysis. Instead of taking imputed consumption expenditures as the truth, two adjustments are made so as to allocate NIPA consumption and medical care in relation to imputed household consumption. Gokhale, Kotlikoff, and Sabelhaus (1996) use the CEX in a similar manner to allocate national accounts consumption across age groups in each year. In addition, since the CEX is used to scale up food consumption in the PSID, the ratio of total nondurables and services consumption to total consumption, rather than the ratio of consumption to income is the relevant series. The ratios of nondurables and services consumption to food consumption in the CEX and NIPA track each other reasonably well, with the exception of changes between 1980 and 1982 (when the CEX improved its survey instrument for consumption) and between 1986 and 1988.

A.3 THE CREATION OF NONDURABLE AND SERVICES CONSUMPTION IN THE PSID

The details of the regressors in the consumption imputation procedures are as follows. The main regression employs a log–log specification with a cubic polynomial of the log of food consumption. Since there are possibly different returns to scale in the household consumption of food and other items, the variables allowed to shift preferences include nine family size dummies for household sizes 1 through 9 or more. The imputation also includes dummies for whether the household head has a high-school degree or less education, some college, or a college degree or more education. To account for shifting preferences across ages, I also include a fifth-order polynomial in age for households less than age 65 and a second-order polynomial in age for households greater than 65. To allow for labor-supply interactions, the preference shifters include a retirement dummy variable, a dummy variable for whether the household is retired and younger than 65, and dummies for whether there are zero, one, or two or more earners. Finally, to capture both prices and preferences, a set of quarter dummies and a set of year dummies are included.

The four steps of the imputation are as follows.

First, using the CEX data, the log of nondurable and services consumption is regressed on a cubic polynomial in the log of food consumption and the remaining regressors just discussed. The CEX regression using 37,730 households explains 80% of the variation in household consumption, although the typical error is 30% of nondurable and services consumption. The coefficients are not reported but are reasonable. A household with a college-educated head consumes 15% percent more nondurables and services relative to food than a household with a head without a high-school degree. Retired households consume 10% more nondurables and services relative to food than a nonretired household.

Second, the estimated equation is used with the same set of regressors in the PSID to predict nondurables and services consumption for each household. The number of earners in the PSID is calculated from reports on labor income and wages of head and spouse. The quarter dummy is set equal to the second quarter, since most PSID households are interviewed in May. Similarly, the year dummy for 1979 is set equal to its value for 1980, and the year dummy for 1994 is set equal to its value for 1993. Constructing the implied consumption-to-income ratio from the imputed data gives a highly volatile series. This said, the average ratio for the first four years is 0.057 below the average for the last four, showing a reasonably good mapping to the aggregate trend.

Third, the imputed consumption for each household is treated as a relative consumption level, and the total consumption across house-

holds is scaled up to include medical purchases by the government. Medical care purchased by the government, except for Medicare, is allocated in proportion to total consumption across all households that are younger than 65 by year. This adjusts consumption of these households upwards by 1.5% to 2.5% of total consumption over the entire sample. Medicare expenditures are allocated evenly across all households age 65 or older in a similar manner, which leads to a scale factor that grows by 10 percentage points over the sample. The elderly account on average for 11% of total imputed consumption. Medicare purchases by the government rise from 1.6% to 3.2% of total consumption expenditures less government spending on health care. Without this adjustment, the consumption of the elderly would be significantly understated and, more importantly, the rise in their consumption would be understated. Income is not adjusted for this consumption that is purchased by the government for households. Interpretation of cohort and age profiles throughout the paper keeps this in mind.

Fourth, the consumption of nondurable goods and services in the NIPA in each year is allocated across households in proportion to each household's consumption from the third step. The allocation is conducted so that the consumption-to-income ratio in the micro data matches that in the NIPA in every year.

When working with the growth rate of consumption, the following modification to the imputation procedure is made. Instead of using the level of predicted consumption in the PSID to allocate NIPA consumption expenditures, the level is used only to allocate medical purchases by the government. In the fourth step of the imputation, the growth rate of NIPA real consumption per capita is allocated across households in accord with their household growth rates. One might be concerned because this procedure ignores the fact that these two series might differ due to household births and deaths. However, in the PSID data, many missing consumption growth rates are not due to birth or death but to missing data. Thus it is also not appropriate to assume that the difference between the PSID growth in consumption and that in the NIPA represents differences in true births and deaths. More importantly, the trend in the time series of consumption growth from the PSID is similar whether one calculates it from averaging levels or averaging first differences. See also the discussion in the text.

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Comment

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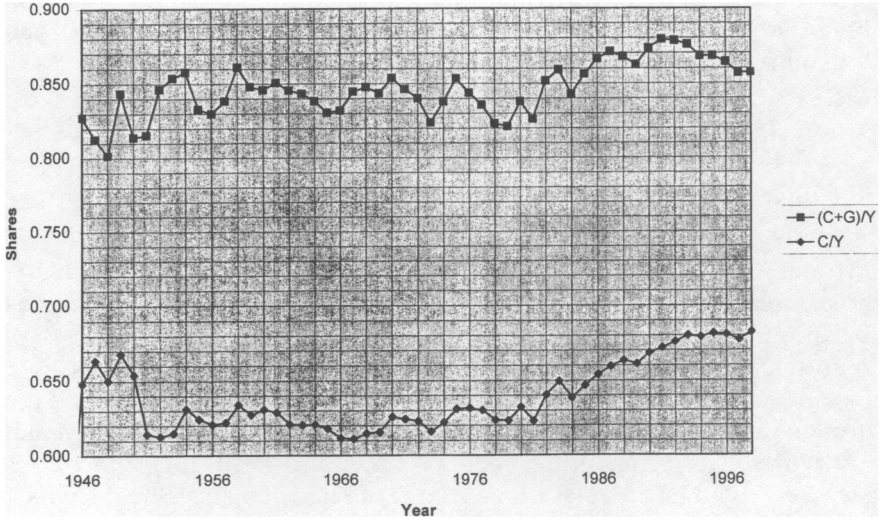
This paper provides a rich analysis of consumption and savings choices. It thoughtfully and productively integrates data from an impressive range of sources, including the Panel Survey of Income Dynamics, the Consumer Expenditure Survey, and the National Income and Product Accounts. Parker documents a large set of important stylized facts. Three of those findings were particularly interesting for me: First, the changing age distribution has played only a small role in the consumption boom of the 1980s and early 1990s. Second, during the consumption boom younger cohorts consumed a larger share of their income than older cohorts did at the same age. Third, younger cohorts had the same rate of consumption growth as older cohorts did at the same age. Parker has resisted the natural temptation to draw too many theoretical conclusions from these interesting findings. He should be congratulated on the scope of his empirical effort and on the modesty of his subsequent conclusions.

However, I do take issue with one underlying point of this paper. The

Meghana Bhatt provided excellent research assistance. Laibson acknowledges the financial support of the National Science Foundation (SBR-9510985) and the MacArthur Foundation.

Figure 1 TOTAL CONSUMPTION AND CONSUMPTION AS SHARES OF GDP



paper is motivated by the consumption boom during the 1980s and 1990s. There is clearly some evidence for such a boom. But this evidence is not overwhelming, and it appears that the consumption boom is now over, an important reversal that Parker underemphasizes. For example, by historical measures, consumption is at a postwar *low* relative to standard benchmarks for human and physical capital.

To tell this story it is helpful to begin with Parker's aggregate analysis of consumption benchmarks. Parker begins by pointing out that the consumption share of GDP (i.e., C/Y) has risen during the past two decades. Parker also discusses total consumption, which comprises both household consumption and government consumption. Extended time series (1945–1998) of C/Y and $(C + G)/Y$ are plotted in my Figure 1.

Looking at Figure 1, the boom in C is clear, but the rise in $C + G$ is more muted. The ratio $(C + G)/Y$ reaches a postwar peak of 0.879 in 1991. But by 1998 this ratio had fallen to 0.857, a level which is less than one standard deviation (0.023) above the 1946–1970 mean (0.838). By these calculations, there has been a temporary boom in total consumption, but we have settled back into a fairly typical spending pattern.

However, comparing consumption with current output misses one of the principal economic insights. Forward-looking consumers should want to smooth consumption and hence should base consumption on permanent income. Any effort to evaluate consumption normatively

should take some consideration of the discounted income stream upon which that consumption is ultimately based.

The following relatively transparent framework can be used to compare total consumption to permanent income. Specifically, divide total consumption (TC) by total wealth (TW):

$$\frac{\text{total consumption}}{\text{total physical and human wealth}} \equiv \frac{\text{TC}}{\text{TW}} = \frac{C + G}{\text{NW} + \dfrac{Y_L}{r-g} + \text{GNW}}.$$

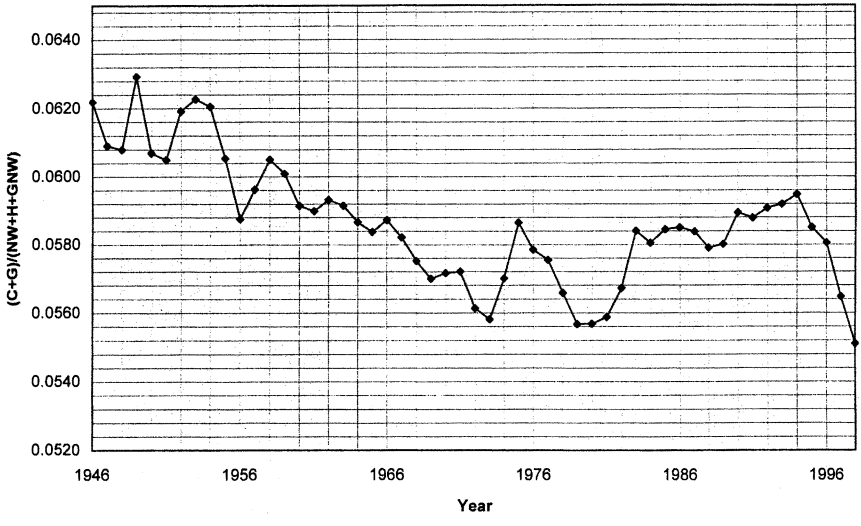
My total wealth measure has three components. First, net worth of U.S. households, NW, is measured by the Federal Reserve's Flow of Funds Balance Sheets. Second, human capital of U.S. households, $Y_L/(r - g)$, represents the net present value of future labor income. Here Y_L is labor income,[1] and $r - g$ is the difference between the real interest rate and the growth rate of labor income. I assume $r - g = 0.05$. Third, governmental net worth, GNW, including federal, state, and local governments, is measured by the Federal Reserve's Flow of Funds Balance Sheets, which only include financial assets and liabilities of the government.[2] Necessarily, omitting governmental tangible assets biases down government net worth, and therefore biases up the consumption ratio at all points in time. But this level bias is not likely to bias the trend.

Figure 2 plots the total consumption to total wealth ratio, TC/TW, during the postwar period. Two properties stand out. First, the time series did increase significantly between 1980 and 1994, seemingly reversing a previous downward trend. But the 1980–1994 increase has now been entirely reversed. By the end of 1998, the series was at an all-time low for the postwar period. These results do not depend at all upon my calculation of human capital. To demonstrate this point, consider Figure 3, which ignores human capital and plots the ratio $(C + G)/(\text{NW} + \text{GNW})$. Now there appears to be no consumption boom whatsoever, and the only prominent feature of the data is the consumption bust during the 1995–1998 period.

To develop intuition for these effects, consider just one source of new wealth in the U.S. economy. In U.S. equities markets, price-to-earnings (P/E) ratios are currently over twice their historical norm. At year-end 1998, U.S. market capitalization was $13.451 trillion,[3] implying that the

1. Specifically, I take compensation of employees from the BEA's National Income and Product Accounts.
2. To a first approximation, GNW is roughly equal to the net debt of the federal government, and hence GNW is negative.
3. Source: International Finance Corporation.

Figure 2 RATIO OF TOTAL CONSUMPTION TO TOTAL WEALTH

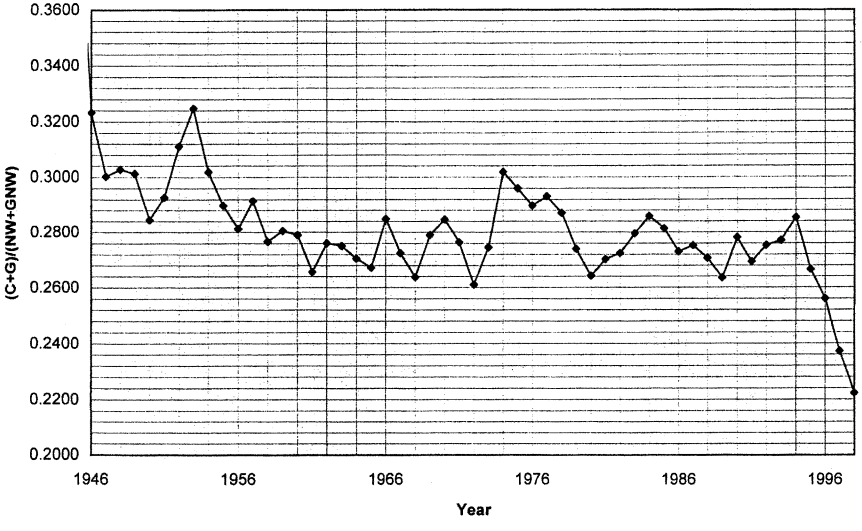


rise in P/E ratios has generated a wealth shock of approximately $7 trillion. With a marginal propensity to consume of 0.05, this wealth shock should have raised total consumption by $350 billion, or 4.1% of an $8.5 trillion economy.[4] Alternatively, note that U.S. equities have generated real returns of approximately 13% per year since 1979, 6 percentage points above the historical rate. Had U.S. equities realized historically average performance over the 1979–1998 period, the U.S. market capitalization would now be approximately $5 trillion, implying that the realized excess returns produced a wealth shock of approximately $8.5 trillion. Assuming a marginal propensity to consume of 0.05, this wealth shock should have raised total consumption by $425 billion, or 5.0% of GDP. Note that the actual long-run rise in the total consumption ratio was only 3.6% of GDP [from a $(C + G)/Y$ ratio of 0.821 in 1979—the lowest value realized in the 1970s—to a 1998 value of 0.857].

Parker is right to point out that there was an anomalous boom in consumption during the 1980s and 1990s. But my calculations suggest that since 1994 the anomaly has evaporated. High levels of total con-

4. Parker estimates an MPC of 0.04, but his estimates are almost surely biased down due to measurement error in household-level wealth data and omitted variables in his regression. For example, failing to include a measure of heterogeneity in the taste for saving will bias the MPC down, since the taste for saving covaries positively with wealth accumulation and covaries negatively (holding all else equal) with consumption.

Figure 3 RATIO OF TOTAL CONSUMPTION TO PHYSICAL WEALTH



sumption are now justified by high levels of total wealth. The ratio TC/TW is now at a postwar low.

Since the rise in TC/TW was temporary, it may be relatively easy to explain. Transitory shocks like the 1980, 1981–1982, and 1990–1991 recessions, and the rapid expansion of consumer credit, can probably jointly explain a significant fraction of the temporary rise in TC/TW.

Finally, collapsing stock prices could rapidly change all of my conclusions. If stock-market wealth falls dramatically (>30%), but consumption stays the same, the consumption puzzle will be resurrected. Unfortunately, I am not able to forecast future values of either the numerator or the denominator of my ratio.

Comment

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1. *What Is Saving? Some Measurement Issues*

The decline in the saving rate in the United States represents a long-standing puzzle. Much research has been devoted to it, but so far there

seems to be more agreement on the reasons that cannot explain the decline than on the reasons that actually can. This paper provides a very thorough investigation of saving, looking at both macro models and aggregate data, and micro evidence on saving. The empirical work on household data tries to disentangle the reasons for the decline in saving by looking at different groups in the population and also by examining the role of the increase in wealth. The main findings are that there is not a unique explanation for the decline in saving, and the paper points to a list of viable candidates.

There are several issues to address when considering saving. The first one is concerned with measurement. Consider a simple manipulation of the budget constraint:

$$W_t - W_{t-1} = rW_{t-1} + Y_t - C_t,$$

where W denotes wealth, C consumption, Y income, and r the interest rate. Saving can be derived by taking the first difference of wealth or by subtracting consumption from (capital and labor) income. At the aggregate level, saving has been measured from the National Income and Product Accounts (NIPA) as the difference between personal consumption outlays and personal disposable income, and from the Flow of Funds (FOF) of the Federal Reserve System as the household sector's net acquisition of assets (including housing) minus its net accumulation of liabilities. These two measures do not generally match, and many adjustments are needed to obtain comparable figures. The most important fact is that capital gains are not counted in the above definitions of saving. However, those gains have become so important that if one were to include them, saving would not even show a decline. Gale and Sabelhaus (1999) have examined the measures of saving from NIPA and FOF and considered several adjustments to the official statistics related to, for example, the treatments of durable goods, inflation, tax accruals, and retirement accounts. Considering those adjustments, the decline in saving is much smaller and the level of saving much higher than reported in the official statistics. On adding capital gains, however, the figures change dramatically. Saving is not only much higher than in the official statistics, but also it shows no decline over time and has actually increased in the 1990s, in particular after 1993. One of the important features of the U.S. economy is that while we observed a decline in saving (at least according to the official statistics), we did not witness a decrease in the stock of wealth.

On moving from aggregate to micro statistics, measurement issues become even more problematic. The two existing data sets on consump-

tion, i.e., the Panel Study on Income Dynamics (PSID) and the Consumer Expenditure Survey (CEX), have serious limitations for calculating accurate measures of saving. For example, the PSID reports information only on food consumption. This measure is not only limited, but also noisy.[1] The CEX has information on total household expenditure, but suffers from severe measurement error in income, and has only limited (and noisy) information about financial assets. In addition, income is top-coded in the CEX, and this makes it difficult to calculate saving for high-income households, which are responsible for a large share of saving in the United States. It is also possible to calculate saving using wealth data from the Survey of Consumer Finances (SCF) or from the PSID, but one has to deal with the issue of how to treat capital gains, which, as mentioned before, are not included in the aggregate statistics.

These observations suggest that one should use much caution in interpreting the aggregate statistics. As far as measurement is concerned, there are different definitions of saving, and which one to choose does ultimately depend on the research question under consideration. For micro data, there is no ideal data set to study saving. The paper uses the PSID, but much data construction and imputation is needed to obtain accurate measures of consumption. More specifically, data from the CEX and NIPA are used to construct a more comprehensive measure of consumption than the one reported in the PSID.

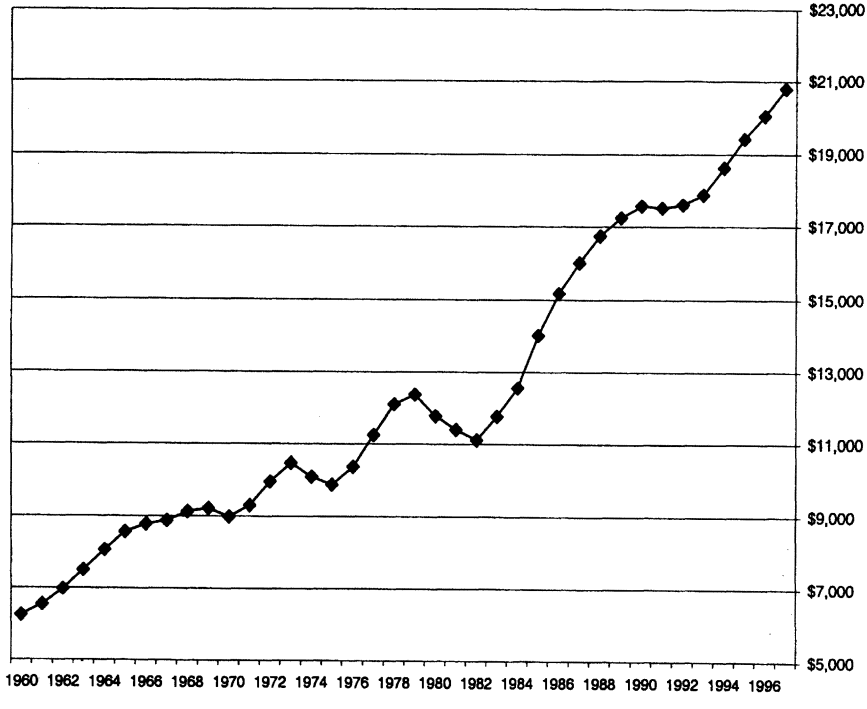
2. *Some Basic Facts*

In addition to the official statistics on saving, the paper reports several important facts, which are not usually present in previous works on the decline in saving. For example, the paper documents that there has been a substantial increase in the ratio of consumption to income, in particular after the 1980s. Additionally, it shows that the household rather than the government sector is responsible for the decline in saving. As mentioned before, the paper also shows that while saving declined, wealth has increased a lot, at least in the aggregate statistics. However, one should note that aggregate data hide important differences across households. Wealth is very unequally distributed among U.S. households, and in the 1980s the distribution of wealth became more spread out.[2] In this respect, only a share of the population enjoyed capital gains on existing assets.

Household debt also surged in the past years. Figures 1 and 2 of this comment show that total debt per capita and one of its components,

1. See Runkle (1991).
2. See Wolff (1994).

Figure 1 PER CAPITA TOTAL HOUSEHOLD DEBT: 1960–1997
(IN 1997 DOLLARS)

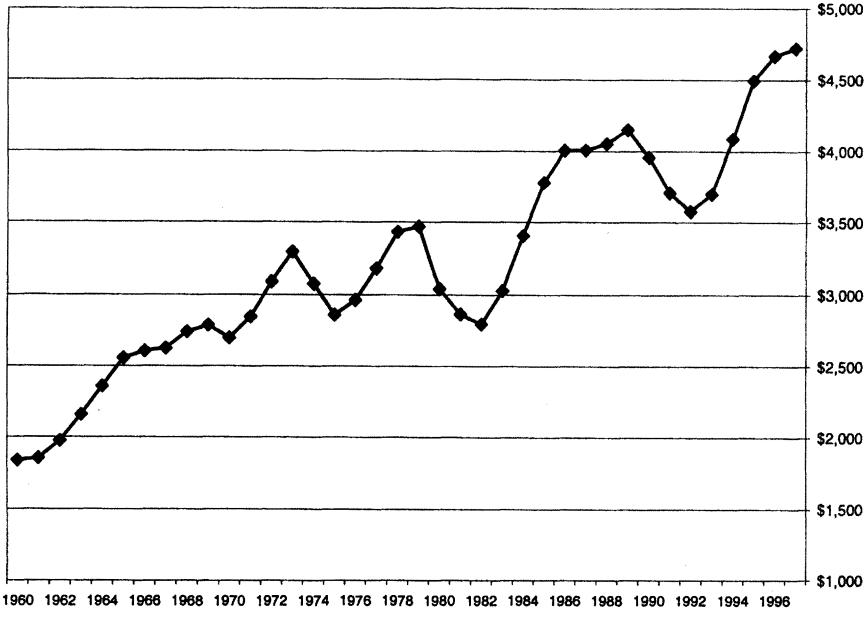


consumer credit per capita, have increased over time and accelerated during the 1990s.[3] This is also a potentially important fact, and it should be kept in mind when modeling household consumption or saving. I will return to it below.

Perhaps a less well-known fact is that the lack of saving is very pervasive among U.S. households. Recent data from the Health and Retirement Study (HRS) show that many households arrive close to retirement with little nonpension wealth. Table 1 reports the distribution of financial wealth, housing equity, and total net worth for a cohort of households whose head is close to retirement (they were 51–61 years old in 1992). Even though these households should be close to the peak of their accumulation, their median financial wealth is $6,000 and median total net worth is less than $100,000. Much of the accumulation is accounted

3. Household total debt is the sum of home mortgage and consumer credit. Consumer credit includes automobile credit and revolving credit, such as credit-card debt and unsecured personal lines of credit. These figures are from the Flow of Funds Accounts of the Federal Reserve System.

Figure 2 PER CAPITA CONSUMER CREDIT: 1960–1997 (IN 1997 DOLLARS)



for by housing equity, but it is an issue whether or not households are using housing wealth to support their consumption at retirement.[4,5] These findings raise some concerns about the financial security of many American households. Saving is also heavily concentrated among the high-income, high-education, high-wealth households. For example, according to Kennickell and Starr-McCluer (1997), households with income of $50,000 and above (in 1989 dollars) accounted for over 75% of total saving. Households whose head had a college degree also accounted for a disproportionate share of saving; depending on the chosen sample, estimates go from 64% to 72%. Note that if saving is calculated to measure the ability of households to finance consumption in retirement, then official statistics may provide an inadequate picture, since, as mentioned before, they do not take into account the appreciation of the existing stock of assets.

4. Financial wealth is defined as the sum of checking and saving accounts, bonds, stocks, and other assets minus short-term debt. Total net worth is the sum of financial wealth, IRAs and Keoghs, housing equity, other real estate, business equity, and vehicles. Figures refer to the sample of households whose financial respondent is not retired. All values are in 1992 dollars. Figures are weighted using survey weights.
5. See Lusardi (1999) and the references therein.

Table 1 DISTRIBUTION OF FINANCIAL AND TOTAL NET WORTH, AGE RANGE 51–61 IN 1992

Percentile	*Financial Net Worth*	*Housing Equity*	*Total Net Worth*
5	−6,000	0	0
10	−2,000	0	850
25	0	0	27,980
50	6,000	42,000	96,000
75	36,000	85,000	222,200
90	110,000	150,000	475,000
95	199,500	200,000	785,000
Mean	46,171	61,613	227,483
(Std. dev.)	(178,654)	(100,646)	(521,467)

Note: Author's calculations from the Health and Retirement Study.

3. *Explaining the Decline in Saving*

While basic facts are important, the important question is: What explains the observed figures? As mentioned before, there have been many explanations for the decline in saving in the United States. In Browning and Lusardi (1996), we reviewed as many as twelve proposed explanations. They can be summarized as follows: (1) the aging of the population; (2) changes in the saving propensities of different cohorts; (3) changes in the structure of households (e.g., divorce rates); (4) changes in the insurance provided by the government (a decrease in the precautionary saving motive); (5) changes in the distribution of income; (6) the decline in aggregate growth; (7) capital gains on housing; (8) capital gains on stocks; (9) the increased annuitization of wealth (due to Social Security and pensions); (10) cash payouts to shareholders; (11) the development of financial markets; (12) changes in the thriftiness and perception of financial security (and other reasons from economic psychology).

This list serves to emphasize that this topic has been heavily investigated, and while we can perhaps rule out some of the explanations suggested by past research, many still remain under debate. The paper adds to the existing explanations by suggesting that there is not a single culprit behind the decline in saving, but several reasons are likely to coexist. The paper offers useful and original insights with respect to previous work. On the one hand, there is an examination of a stylized macroeconomic model. How do we reconcile the movements in consumption with changes in government policies, the behavior of interest

rates, and the stock-market boom? On the other hand, there is a close examination of micro data, using different methods.

It is clear that, to be able to explain the decline in saving, it is necessary to look at micro data. This makes it possible to test different hypotheses, as well as focus on well-defined demographic and economic groups and characterize their behavior. The micro-data analysis, however, is not without limitations. As mentioned before, there is not a single data set that can be used to analyze saving. Data construction is not only cumbersome, but it also requires making several assumptions about the characterization of consumption. For example, the imputation of health expenses is particularly difficult, since those data are only available at the aggregate level. The other problem is that micro data are notoriously noisy and it is hard to estimate effects with precision. Nevertheless, the analysis of household behavior is important, both because this is the sector responsible for the decline in saving and because aggregate statistics hide important differences across population groups.

The first problem in modeling household saving is determining which theoretical scheme to refer to. The paper refers broadly to the life-cycle model, even though it sometimes hints at the importance of incorporating a precautionary saving motive. By using a fairly general specification of the life-cycle model of saving, at least three explanations for the decline in saving can be rationalized. The first one is that the proportion of the elderly has increased; since they should be net dissavers, that may explain the decline in saving. This can be called an *age effect.* An additional explanation is that individuals born in different time periods display different saving behaviors. This may be due to the fact that their resources are different or that preferences are different across generations. This can be called a *generational* or *cohort effect.* A third explanation is that the behavior of the macro economy has affected saving. This can be called a *time effect.*

Unfortunately, it is not possible to decompose the observed decline in saving into age, cohort, and time effects. This is due to the well-known identification problem in using time, cohort, and age dummies: Their effects cannot be separately identified, since year of birth (or cohort) plus age is simply equal to time. There are several ways to get around the identification problem.[6] One way is to use identifying assumptions—for example, restrict the estimates on the time dummies. This approach was originally used by Deaton and Paxson (1994) and is also implemented in this paper. While it has several advantages, it leaves open the question of how to interpret cohort effects: are they due to economic conditions,

6. See Heckman and Robb (1985) and Attanasio (1998).

for example differences in the rate of productivity growth across generations, or are they due to preferences? It is not possible to disentangle these effects by simply using cohort dummies. Another alternative is to use better proxies for these effects than dummy variables, and/or to model the effect explicitly. While this requires putting more structure into a specific model of saving and making assumptions about the variables necessary to estimate the model, it may provide a clearer interpretation of the cohort effects. An additional advantage of this approach is that it allows a more flexible specification for these different effects. For example, it is easy to think of cases where age, cohort, and time effects are not simply additive. Kapteyn, Alessie, and Lusardi (1998) use a simple life-cycle model of saving and show that the introduction of a universal social security system in the Netherlands in the mid-1950s introduced an interaction between age and cohort effects. Rather than using cohort dummies, they model the cohort effect in wealth and saving explicitly by constructing measures of productivity growth and the generosity of the social security system across different generations.

Which interpretation to attach to cohort effects is a rather critical issue in this paper. As the empirical work shows, age effects can be easily dismissed as an explanation for the decline in saving. This is consistent with the findings of many other papers.[7] It is almost intuitive why this is the case. Changes in the age structure of the population are too slow to be able to rationalize the decline in saving. Note that while the decline started perhaps two decades ago, it has become precipitous since the mid-1980s, at least according to the official statistics. The importance of time effect is not clearly assessed. In one specification of the empirical work, these effects are restricted *ex ante*. By making the assumption, as in Deaton and Paxson (1994), that time effects are orthogonal to a linear time trend and average to zero, all (linear) trends observed in the data are attributed to age and cohort effects. This restriction is relaxed when estimating a consumption function, and in that context time effects are found to be significant in sign and magnitude.

A main finding of the paper is that cohort effects are significant and important for explaining the decline in saving. More precisely, every generation is consuming more than the previous generation did at a similar age. This finding is relevant per se, even though it is open to many interpretations. First, note that it is partly in conflict with previous research.[8] While other authors too attribute the decline in saving mainly to cohort effects, the cohorts that are responsible for the decline differ

7. See the discussion in Browning and Lusardi (1996) and the references therein.
8. Some studies, such as Bosworth, Burtless, and Sabelhaus (1991), report results in line with this paper that saving has declined across every age group.

widely across studies. For example, according to Boskin and Lau (1988), the generations born after 1939 are the ones responsible for the decline in saving. This is in contrast with the findings of Attanasio (1998) that it is not the baby-boomers, but the generations born between 1925 and 1939, that shifted down their saving. In other words, it is the generations that should be at the peak of their saving during the 1980s that are saving less. Gokhale, Kotlikoff, and Sabelhaus (1996) provide yet a different explanation. According to their study, it is mainly the elderly that are responsible for the decline in saving. They document that the government redistributed resources from young and future generations to current old ones and there has been a sharp increase in the propensity of older Americans to consume out of their remaining lifetime resources.

It is not obvious why the findings are so different, and what explains the different conclusions reached by different authors, in particular among studies using similar micro data sets and similar versions of the life-cycle model of saving. We await a study that can explain those differences and generate some consensus on this topic.

Second, there is the problem of interpreting cohort effects when using cohort dummies. What do cohort effects capture—differences in economic circumstances, or differences in preferences across generations? The fact that all generations consume more than previous ones seems to indicate a plurality of reasons for the decline in saving, even though it is not obvious which are the correct ones. For example, transfers from the government are a possible explanation, but they have affected generations differentially, and it is the elderly, if any, that have benefited from them. Similarly, changes in the financial markets, and in particular in the opportunities for borrowing, should have affected the younger generations. Changes in preferences, such as impatience, could also be changing across generations. In this case it is difficult to expect a dramatic change across (adjacent) generations, and any such change should have affected prevalently the younger generations, even though it is not clear which ones (individuals born after the Great Depression, or after the war, or the late boomers?).

The paper suggests that several reasons could be at work, such as an increase in government transfers that explain the decline for the elderly combined with the development in the financial markets that changed saving for the young. While plausible, this explanation requires further investigation, since it is not easy to rule out the possibility that preferences, such as impatience or attitudes toward saving (thriftiness, expectations toward the future), have changed across generations.

In the attempt to explain cohort effects, the paper resorts to estimating a consumption function. To model cohort effects explicitly, wealth and

the permanent component of income are considered in the estimation of a consumption function. Thus, the analysis allows a close evaluation of how much of the increase in consumption is attributable to the increase in wealth that was documented earlier.

The results from estimating consumption functions do not provide evidence in support of one specific explanation or set of explanations for understanding cohort effects. Overall, the estimates suggest that a rather limited share of the consumption boom can be explained by the increase in wealth. But estimates from these equations are not without difficulties. If households have financed the increase in consumption by borrowing from future resources, then low wealth (but not necessarily zero or negative, which in the estimation is treated as a separate group) can be highly correlated with high consumption, and current estimates may not adequately capture this nonlinear effect. In fact, even households with zero or negative wealth are found to have high consumption.

In addition, much attention both in the media and in some current academic research has focused on the effect of the stock-market boom. Given the importance of capital gains in the measures of saving mentioned before, this is an important issue to study. However, it is hard to evaluate the effect of the stock market from the estimates of the consumption function. Even though the dummy for stock-market participation is statistically significant, much of the effect may be due to the increase in the wealth invested in stocks, which is not separately identified.

The theoretical model that underlies the calculation of the consumption function assumes that borrowing is severely limited. More specifically, assets are assumed not to go negative. This implicitly rules out the importance of the development of financial markets. As documented in the figures shown before, many households can borrow, and they have increased substantially the amount of debt that they are holding. Similarly, it is not surprising that cohort effects are still present in the data after allowing for wealth and the permanent component of income, since those two variables could be poor predictors of future resources across cohorts.

From consumption functions the analysis shifts at the end to the estimation of Euler equations. Thus, from the examination of consumption levels the analysis goes to the examination of growth rates of consumption. However, it is hard to gain clear insights into the decline of saving from Euler equations. On the one hand, data in first differences are very noisy, and estimates are often poor and unreliable.[9] On the other hand,

9. See the discussion about estimating Euler equations using micro data in Browning and Lusardi (1996).

we do not know whether the Euler equations are well specified. If some households face borrowing constraints, then there should be additional terms in the Euler equation (a proxy for the Lagrange multiplier) to capture the fact that consumption grows more for constrained than for unconstrained consumers.[10] While borrowing constraints are explicitly considered in the derivation of the consumption function, they are not considered in the derivation of Euler equations. Additionally, apart from the case of quadratic preferences or the certainty equivalence case, the variance of consumption growth should also appear in the Euler equation. This is because, for households that have a precautionary saving motive, uncertainty depresses consumption and consumption should grow faster for households facing greater uncertainty. While the derivation of the consumption functions relaxed the assumption about certainty, the Euler equations do not allow for uncertainty.

Euler equations have the advantage that one does not have to specify the income process of households or their expectations about future events. Nevertheless, specific assumptions have still to be made about how to characterize preferences and the economic environment, for example whether households are impatient, whether they have a precautionary saving motive, and whether there are borrowing constraints or other market imperfections. To illustrate this point more clearly, note that in addition to the expected interest rate and a set of cohort dummies, wealth (in logs) is added to the Euler equation. The justification for adding wealth reported in the paper is to evaluate whether unexpectedly high asset returns are the causes of the consumption boom. Even though it is statistically significant only in one specification, the sign of wealth is negative rather than positive. However, as is mentioned in the paper too, wealth might be capturing precautionary saving, i.e., the fact that the wealthy have lower precautionary saving motives. Alternatively, it might be capturing the fact that the wealthy do not face stringent borrowing constraints.

In the end, the analysis of consumption from these three different angles—the decomposition of the data into age, cohort, and restricted time effects; the estimation of consumption functions; and the estimation of Euler equations—does not pin down a single explanation for the decline in saving, and sometimes it leads to somewhat different and conflicting results. It is plausible that this is the result of different identifying assumptions. On the one hand, the decomposition into age, cohort, and time effects requires making assumptions about the behavior of one set of dummies. On the other hand, the estimation of con-

10. See Zeldes (1989).

sumption functions and Euler equations requires making modeling assumptions about the preferences of individuals and the potential imperfections in the financial and insurance markets they could face. Given that there is much debate on which theoretical model can best describe saving (life-cycle models, models with intergenerational transfers, precautionary saving, etc.), there is no safe avenue for studying the decline in saving. Different methods have their own shortcomings, and overall the results of employing those different methods in this paper may also be interpreted as showing how hard it is to explain saving well and how many difficulties the traditional theories of saving have in rationalizing the empirical findings.

To summarize: this paper has taken up the difficult task of explaining the decline in saving. With respect to previous work in this area, it proposes that there are several different explanations at work that can explain saving. Among them, a combination of government transfers to the elderly, changes in preferences (impatience or attitudes toward saving) across generations, and changes in the development of financial markets seem most promising and a useful avenue for future research.

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Discussion

In his reply Parker noted that the biggest increase in the ratio of government and household consumption to GDP occurred in the 1980s; during the past 4–5 years, as the stock market rose, the consumption ratio declined. These facts pose a problem for the view that the consumption boom is the result of rising asset prices. Responding to Annamaria Lusardi, Parker argued for the usefulness of estimated Euler equations. He said that the correlation of consumption growth and the real interest rate during the 1980s, which he uncovered by looking at Euler equations, is both interesting and a potentially important clue to the source of the savings decline.

Mark Gertler asked about the role of fiscal policy. He noted that the rise and decline of the Reagan-era deficits might help explain movements in the broad consumption ratio in the 1980s. Michael Mussa noted that declines in defense spending amount to a gain in wealth for households, which might account for some increased consumption. Parker pointed out that defense spending increased during the early 1980s; this buildup should have crowded out consumption, but there is no evidence that it did. Similarly, the recent decline in government purchases as a share of GDP has not had a positive effect on consumption. Gertler remarked that the means of financing of government spending, i.e., whether through debt or taxes, may also matter.

Giuseppe Moscarini asked about the role of medical expenses, which are treated as consumption but might better be thought of as including an investment component. Some studies have found increased spending on medical services to be a large part of the increase in measured consumption. Benjamin Friedman noted the possible effects of the "marketization" of the economy, i.e., services once provided in the home or

without monetary compensation are now bought and sold in markets and are thus counted as consumption. Examples are elderly people living independently (and thus paying rent) rather than staying with children, and women entering the labor force who now purchase housework and child-care services in the market. Friedman suggested looking at consumption subaggregates by age group to see if this hypothesis makes sense. Ben Bernanke noted that marketization adds to measured income as well as consumption, which moderates though it does not reverse the effect on the consumption-to-income ratio.

Friedman also noted that in some sense we have no option but to save wealth created by asset revaluations, since current consumption can be increased only at the expense of current investment or by running a larger current-account deficit, both limited options. Indeed, if individuals tried to consume their capital gains, those gains would vanish as everyone tried to sell their shares. Pierre-Olivier Gourinchas noted that U.S. net foreign assets have switched from large positive to large negative in past decades, so that the willingness of foreign lenders to finance the U.S. consumption boom should not be downplayed. Agreeing with Friedman, Daron Acemoğlu said there is no easy way of reconciling the behavior of the stock market, savings, consumption, and the real interest rate with a partial-equilibrium model and that a general-equilibrium approach is needed.

Bernanke wondered whether a decline in precautionary savings, arising from low unemployment and easier access of households to credit, might explain the trends. Parker agreed that young households can borrow much more easily today than in the past and that they appear to be taking advantage of that, in that young households are consuming more and middle-aged households consuming less than a generation ago.

The discussion turned to the cross-sectional differences in saving and wealth. Deborah Lucas worried about the adequacy of the savings of many older individuals. Lusardi cited work showing that a large fraction of people close to retirement have both low saving and low wealth. Parker suggested this might be partially due to the increased variance in wealth. He also noted that for low-income households, low saving rates might be rational, if social security plus any private pension replace a large share of working-life income.