Volume Title: National Saving and Economic Performance

Volume Author/Editor: B. Douglas Bernheim and John B. Shoven, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-04404-1

Volume URL: http://www.nber.org/books/bern91-2

Conference Date: January 6-7, 1989

Publication Date: January 1991

Chapter Title: Market Value versus Financial Accounting Measures of National Saving

Chapter Author: David F. Bradford

Chapter URL: http://www.nber.org/chapters/c5986

Chapter pages in book: (p. 15 - 48)

1 Market Value versus Financial Accounting Measures of National Saving

David F. Bradford

1.1 Introduction

This essay is a venture into well-trodden terrain: the definition of saving. Because so many others have thought about the same issues, probably nothing I say here has not been said before by someone else. J.R. Hicks (1946) mapped the territory in a particularly well-known theoretical treatment. More recently, Auerbach (1985), Boskin (1986, 1988), Eisner (1980, 1988), Goldsmith (1982), Peek (1986), Ruggles and Ruggles (1981), and Shoven (1984) have discussed many of the points raised here in connection with empirical explorations of saving and wealth. In his presidential address to the American Economic Association, Eisner (1989) included the main theses argued here in a broadside indictment of the divergence between measurement and theory to be found in economics. This paper differs, perhaps, in degree of emphasis of two propositions. The minor theme is that saving should be defined by reference to the underlying concept of wealth to which the saving is an increment. The major theme is that the most useful wealth concept is the market value of

David F. Bradford is professor of economics and public affairs at Princeton University and Director of the Research Program in Taxation at the National Bureau of Economic Research.

This is a revision of a paper prepared for an NBER conference on saving held January 6–7, 1989. The author would like to thank Alan Auerbach, William Beaver, Michael Boskin, John Campbell, Angus Deaton, Bronwyn Hall, Robert Hall, Alan Huber, Robert Lipsey, James Poterba, Robert Shiller, John Shoven, Scott Smart, Frederick Yohn, Jr., and conference participants for helpful discussions of various aspects of this research and Kathleen Much for editorial advice. This paper was completed while the author was a fellow at the Center for Advanced Study in the Behavioral Sciences, Stanford, California. The author is grateful for financial support provided by Princeton University; the John M. Olin Program for the Study of Economic Organization and Public Policy, Princeton University; National Science Foundation grant BNS87–00864; the Alfred P. Sloan Foundation; and the National Bureau of Economic Research.

assets, not the cost-based measure of capital implied by the use of national income and product account (NIPA) saving. Whereas NIPA investment measures tell us something about the margin of productive additions to the stock of wealth in a particular form, the (definitionally equal) saving measures are neither those that the microeconomic theory of consumption explains nor those appropriate to assess national economic performance.

Inspection of a sample of the extensive literature commenting on and analyzing national saving has surprised me by the diversity of positions, often implicit, on these issues. It appears that the macroeconomists are truer to microeconomic principles than are many of those who approach the subject from a public finance perspective. The fact that so much research is carried out making use of statistical measures of saving that seem to me to bear so little relationship to economic theory suggests there is a place for a review of fundamentals and display of some basic data related to them.

1.1.1 Income, Saving, and Wealth

Beginning students are taught that saving is a residual, what is left from personal income after deducting consumption and taxes or after deducting from aggregate income consumption by households and governments. But saving is also conceived of as an addition to wealth, and it is not always recognized that the three ideas—consumption, income, and wealth—are not independent. Defining any two determines the definition of the third. The Schanz-Haig-Simons (SHS) conception of income familiar to public finance takes the ideas of consumption and wealth as fundamental and *defines* income as the sum of consumption and the change in wealth during an accounting period. The basic notion of wealth, in turn, is the market value of a household's (or household aggregate's) stock of claims on goods and services in the future.[1] This is the approach to saving taken by the microeconomic theory of household behavior.

Most commentary on and analysis of national saving, by contrast, start with a NIPA definition of income. To make life confusing, the term "income" in the national income account context is attached to factor payments and makes distinctions between taxes regarded as falling on factor payments and those that do not (indirect business taxes). It is doubtful that there is an economically meaningful distinction between taxes that bear on factor payments and those that do not. We can cut through the problem if, for the concept of income in the SHS sense, we read "product" in the national accounting sense.

Which of the three notions—product, consumption, wealth—are fundamental in the case of national income accounting is not immediately obvious. As is well known, national income accounts involve two conceptions of product, gross and net. Gross national product, "the market value of the goods and services produced by labor and property supplied by residents of the United States (U. S. Department of Commerce, Bureau of Economic Analysis 1986),

and consumption, personal and governmental, can reasonably be described as the fundamental ideas. Together (by subtraction) they define gross investment and saving. To reach *net* product, *net* investment, and *net* saving, it is necessary to subtract an allowance for the "using up" of the reproducible capital stock, a wealth notion. Here, then, it is the wealth and consumption ideas that are fundamental: we can think of net product (income) as definitionally equal to the sum of consumption (personal and governmental) and the change in the reproducible capital stock owned by U.S. residents.

1.1.2 NIPA Saving and Financial Accounting

In its treatment of business investment and its yield, the NIPA net income concept can be loosely characterized as a consolidation of the account books of business firms. This is not to suggest that the NIPA accountants actually aggregate the income statements and balance sheets of firms. It is rather to emphasize that investment (and therefore saving) in the national income and product accounts consists of acquisitions of tangible property and is, furthermore, cost-based, constructed from historical data on expenditures for machines, structures, and inventories. Increments in the value of intangible property and (what may be the same thing) revaluations of tangible property arising from its location within going businesses are excluded from the NIPA income and saving concepts. Net saving in the national income and product accounts constitutes the change in the stock of reproducible business capital.[2] The NIPA capital data can be thought of as the figures financial accountants would present if they used the NIPA depreciation conventions and adjusted their historical cost-based entries on tangible assets (including inventories) annually to what they would be had historical prices been instead at current levels.

The main difference between the two conceptions of wealth corresponds roughly to the difference between financial accounting for the net worth of business firms, on the one hand, and the market valuation of those firms on the other ("roughly" because financial accounts include intangible assets acquired by purchase from another firm). The difference is sometimes summed up as that between recognition or not of "capital gains," but this description hides as much as it reveals. The market value of the equity of a firm may differ from the "book" value of its tangible property for many reasons, including changes in the supply price of the capital items in question (for which national income accounting makes a correction), changes in discount rates, and changes in the beliefs about the future upon which market valuation of assets depends—all of these give rise to capital gains in the popular sense of the term. But the two values also may differ because of the genuinely stochastic character of the returns on investment and the conservative quality of business accounts, which result in little or no tracking of the accumulation of intangible capital and of such assets as proven oil reserves.

1.1.3 Empirical Relevance: A First Look

Available data suggest that the difference in definition corresponds to a significant difference in aggregate wealth measures. Table 1.1 shows estimates of the net worth of nonfinancial corporate business in the United States (including corporate farms) and of the market value of the equity claims on those firms. The figures are derived from the Balance Sheets for the U.S. Economy (hereafter, National Balance Sheets) prepared by the Board of Governors of the Federal Reserve System (1988).[3] Net worth consists of the difference between assets and liabilities on the account books after various adjustments. Assets in this case include reproducible assets at replacement cost (i.e., after adjusting valuation based on historical cost for changes in the acquisition prices of the same assets), land at market value, and direct investment abroad by U.S. firms. Liabilities include all the usual sorts of debt (at book value), profit taxes payable, and foreign direct investment in the United States. I would emphasize that in its treatment of fixed investment the net worth in table 1.1 is essentially the concept implicit in NIPA accounting for saving. The market value of equity is essentially that appropriate for the SHS saving concept, which, in turn, is in the concept "explained" by microeconomic theories of saving behavior.

It is evident from table 1.1 that the market value of equity and the net worth on firms' books are very different. The column titled "Market Value/Net Worth Ratio" shows the ratio of the market value of the equity claims to the consolidated nonfinancial corporate sector to the consolidated financial accounting measure of net worth, that is, the sum of tangible and financial assets (including direct investment abroad) less the sum of debt claims (at book value), profit taxes payable, and foreign direct investment in the United States. Since 1948 this ratio has varied over a remarkable range, with a high of 110.1 percent at the end of 1968 and a low of 36.7 percent at the end of 1978.

To put the divergence between accounting and market values of corporate equity in perspective, the column of table 1.1 headed "Net Worth Less Market to GNP" shows the ratio of the difference to the GNP. The difference ranges between an excess of over 7 percent and a shortfall of over 62 percent, with a substantial decrease on average. Figures 1.1 and 1.2 make the points graphically.

It seems clear that the basic objective of the National Balance Sheets, to measure wealth at market value, is the one appropriate for discussions of saving. Nevertheless, economists widely accept and use for this purpose the NIPA saving data. Distinguished examples (and I make no claim to a systematic review of the literature) include Blades and Sturm (1982), Boskin and Lau (1988), Campbell (1987), Lipsey and Kravis (1987), most of the contributors to Lipsey and Tice (1989), Poterba (1987), and Summers (1985).

In at least some of these instances, lack of market-value wealth data is taken

Table 1.1 **"Book" Net Worth and Market Values of U.S. Nonfinancial Corporate Business, Year End, 1948–87**

Year	Net Worth of U.S. Nonfinancial Corporate Business ($ millions)	Market Value of Corporate Equities ($ millions)	Market Value/ Net Worth Ratio (%)	Net Worth Less Market to GNP (%)
1948	209,615	83,862	40.0	48.1
1949	219,672	92,205	42.0	49.0
1950	244,190	116,647	47.8	44.2
1951	269,211	138,250	51.4	39.3
1952	285,071	149,941	52.6	38.4
1953	300,142	144,776	48.2	41.8
1954	315,117	216,033	68.6	26.6
1955	342,531	269,173	78.6	18.1
1956	378,078	289,169	76.5	20.8
1957	403,297	242,470	60.1	35.7
1958	419,289	342,082	81.6	16.9
1959	439,972	361,299	82.1	15.9
1960	448,422	354,114	79.0	18.3
1961	461,733	428,294	92.8	6.3
1962	475,580	389,171	81.8	15.0
1963	489,970	456,076	93.1	5.6
1964	513,321	509,516	99.3	.6
1965	543,746	553,720	101.8	−1.4
1966	583,906	504,223	86.4	10.3
1967	621,655	651,678	104.8	−3.7
1968	668,880	736,506	110.1	−7.6
1969	729,963	646,230	88.5	8.7
1970	784,634	648,492	82.6	13.4
1971	856,111	758,897	88.6	8.8
1972	934,346	855,233	91.5	6.5
1973	1,048,013	678,436	64.7	27.2
1974	1,337,118	499,098	37.3	56.9
1975	1,491,060	684,337	45.9	50.5
1976	1,647,452	787,807	47.8	48.2
1977	1,817,268	748,002	41.2	53.7
1978	2,107,859	773,143	36.7	59.3
1979	2,419,386	933,373	38.6	59.2
1980	2,780,531	1,293,116	46.5	54.4
1981	3,109,641	1,214,845	39.1	62.1
1982	3,230,025	1,382,773	42.8	58.3
1983	3,327,399	1,638,730	49.2	49.6
1984	3,447,798	1,617,733	46.9	48.5
1985	3,503,026	2,022,648	57.7	36.9
1986	3,560,138	2,332,629	65.5	28.9
1987	3,657,167	2,331,322	63.7	29.3

Source: See text. Based on Board of Governors of the Federal Reserve System (1984).

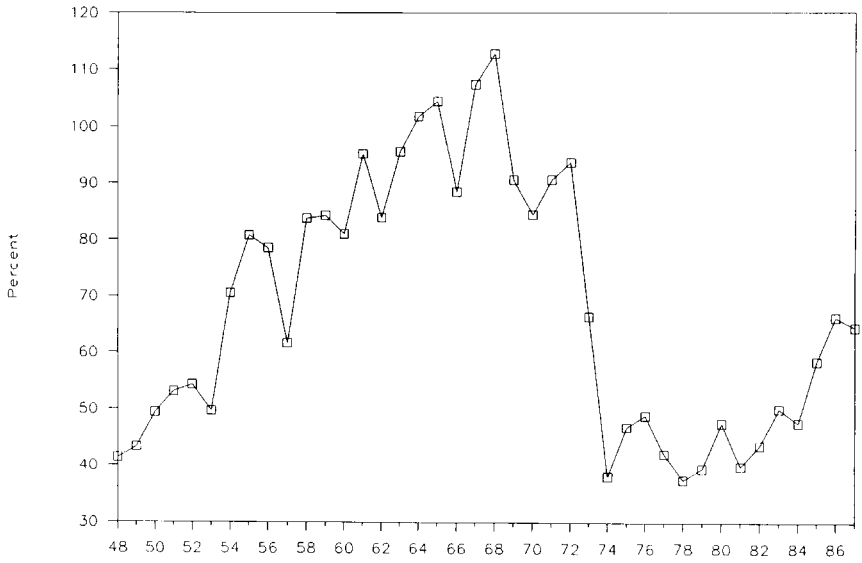

Fig. 1.1 Market value of corporate equity/corporate net worth, 1948–87

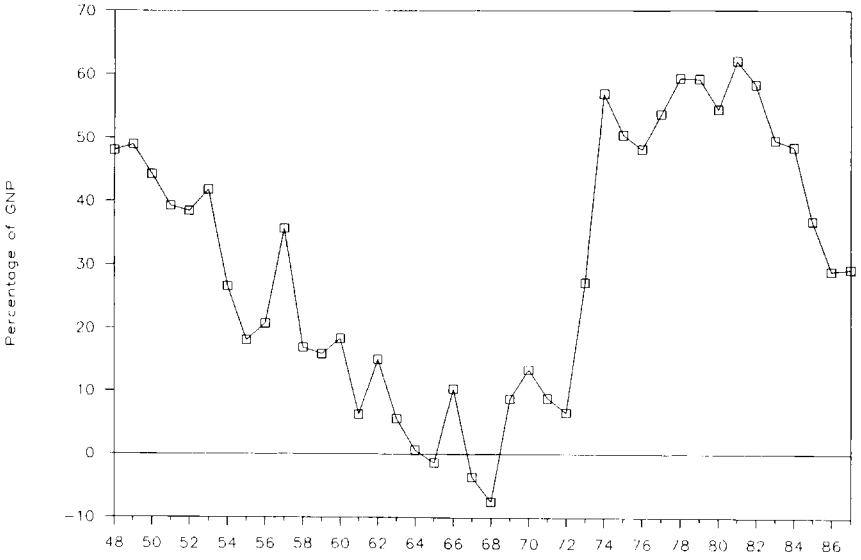

Fig. 1.2 "Book" less market value of corporate equity, 1948–87

to justify resort to NIPA concepts, and some analysts (e.g., Auerbach 1985; Boskin 1986, 1988; Poterba and Summers 1987) have noted the potential role for the market-value data provided in the National Balance Sheets. Summers and Carroll (1987) explicitly analyze aggregate saving in the National Balance Sheets sense (although they do not regard it as preferable to the NIPA measure). Noting that "national income account (NIA) data provide notoriously poor proxies for the economic concepts of saving and investment," Obstfeld (1986, 82) explores some of the biases that may result from the use of NIPA data in comparing saving and investment behavior of countries. Some macroeconomists—for example, Hall (1978, 1988) and Campbell and Deaton (1988)—go out of their way to avoid measuring saving. Hall, in particular, has argued that income aggregates are misplaced in macroeconomics; focus should instead be on aggregate consumption and labor earnings. Granting some such exceptions in the literature, I think it is fair to say that there is wide acceptance of NIPA saving measures.

In this paper I argue that wealth and consumption are both important variables in economic models and important measures of economic performance, that income should be viewed as a derivative concept in this connection, and that the appropriate concept of wealth is measured at asset market value. We should use NIPA *saving* measures only to the extent that they serve as reasonable proxies for the market-value measures. (This is not to suggest that the corresponding investment concepts are not useful in the analysis of production.) Although it is ultimately a statistical question whether the NIPA saving measures are reasonable proxies, the evidence from the National Balance Sheets leads me to doubt it.

In the next part of the paper I review the relationship between the two notions of wealth (and therefore of saving): market value of assets and financial accounting net worth. I then take up objections to the use of market-value wealth. The fourth section presents time-series data on the behavior of national saving in the U.S. economy, and the fifth raises, without solving, some significant problems with the National Balance Sheets data as measures of market value.

Much attention has been paid in recent years to the saving performance of U.S. residents, which has been generally judged disappointing. My contention, that the NIPA saving aggregates and ratios of NIPA saving to NIPA income measures are poor indicators upon which to base conclusions, is neither inherently in favor of this assessment nor opposed to it. One may still be dissatisfied with the U.S. saving record when it is looked at in the framework suggested by microeconomic theory. The sixth section presents some observations on this issue.

1.2 Concepts of Wealth

1.2.1 Market Value of Assets

The SHS notion of income underlying the base of an income tax (or at least generally accepted by academic commentators as the *proper* base of an income tax) is the sum of the change in the wealth and the consumption of the taxpaying unit, be it an individual or a family. Consumption and wealth are the primitive concepts, which need to be given operational substance to produce a tax system. Although the general ideas seem obvious enough, both pose difficult problems of definition at the margin. Within limits, the standard to which the operational definitions refer in a tax policy context is essentially normative—one starts with a notion of ability to pay and designs the income measure to implement it. (The limits relate to the substitutability of different forms of wealth in taxpayer portfolios.)

In *Untangling the Income Tax* (Bradford 1986) I suggested that the usual arguments justifying the SHS income concept as a tax base imply a definition of a person's wealth as "the maximum amount of present consumption he could finance currently by selling or otherwise committing all of his assets" (22). If this definition is accepted, the operational focus shifts to the identification of "assets" and quantifying the opportunities of "selling or otherwise committing" them. Examples of significant but hard-to-quantify assets are human capital (the present value of a person's future earning power) and the discounted value of inheritances. It is interesting that these two are also examples of assets that are difficult to sell or "otherwise commit." Proponents of SHS income taxation normally exclude both human capital and the value of great expectations from the wealth component of the definition of income.

Experience with tax administration gives us numerous examples of the fact that it is the market value of wealth, rather than its accounting value, that figures in individual behavior. If tax on accruing market value (capital gains) is deferred, taxpayers will concentrate their portfolios in assets that generate accruing value rather than cash income. If accounting measures of depreciation are different from actually accruing changes in value of assets, taxpayers respond in well-known ways.

A simple two-period model of a person's intertemporal budget constraint will help clarify the role and nature of wealth in the analysis of behavior, in this case the explanation of consumption levels. For the purpose, we can imagine a world in which there is just one consumption good and in which labor is supplied inelastically, with no welfare significance. We conceive of people as born into this world with inherited resources (to be specified), working one unit of time during the first period to earn the wage w_1 (measured in consumption units), consuming an amount C_1, and applying any excess of the wage over consumption to purchase assets. In the second period, the person also works one unit of time to earn the wage w_2 and consumes that amount

plus the results of liquidating the assets. The problem is to choose an amount of first-period consumption and a portfolio of assets.

In the most basic model, there is no uncertainty (so there is no information problem). The second-period wage is known and there is a single asset available, which we may think of as a discount bond paying one unit of consumption in period 2. The going price for the asset is p_2. The person is born holding B_1 units of the bond and, in the course of period 1, chooses the number of units of the asset to buy (or sell) so as to carry B_2 units into period 2. Two equations—(1) and (2)—define the lifetime budget constraint.

$$C_1 + B_2 p_2 = w_1 + B_1 p_2. \tag{1}$$

$$C_2 = B_2 + w_2. \tag{2}$$

The intermediate asset position, B_2, can be eliminated between (1) and (2) to yield a single lifetime budget constraint, (3).

$$C_1 + C_2 p_2 = w_1 + w_2 p_2 + B_1 p_2. \tag{3}$$

The right-hand side of equation (3), $w_1 + w_2 p_2 + B_1 p_2$, is the market value of "opening wealth" (*including* human capital). We see from (3) that in this simple world we can specify the person's opportunity set completely with two numbers, opening wealth and p_2, the price of claims on period-2 consumption (or the interest rate). To specify the opportunity set without capitalizing labor services, we need four numbers, $B_1 p_2$, w_1, w_2, and p_2: opening *nonhuman* wealth, wages in the two periods, and the interest rate.

This simple formulation reminds us that if we are looking forward from a point in time and want to explain consumption levels, wealth is a needed piece of information. It also demonstrates that it is not the only piece of information we need to explain consumption or, a related problem, to assess a person's welfare, even under the simple, perfect market conditions of the model. In general, information about prices is needed—here, wages and the interest rate and in a multiperiod setting, wages, relative prices of goods, and a term structure of interest rates. By inspection of condition (3) we see that in the simple model the welfare of the individual is increasing in opening wealth including human capital and decreasing in the price of future consumption (i.e., increasing in the interest rate). But even in this case, when human capital is excluded, although welfare is still increasing in opening wealth, the effect of an increase in the interest rate on the assessment is indeterminate and hinges on the taste for consumption in period 2. Simply put, a high interest rate is bad for someone who wants to borrow against tomorrow's earnings to consume more today.[4]

Initial nonhuman wealth is a given, a parameter, in the model described above; wealth along the way (initial wealth augmented by saving) is chosen, endogenous. A complete model would explain initial wealth, too, so it would drop out of the analysis. Wealth would return as an explanatory variable,

though, with the introduction of uncertainty. Then the wealth along the way is the result of the individual person's choice and luck, so second-period consumption would depend upon the market performance of the portfolio. The same would be true for the aggregate of individuals.

The model reminds us that to predict the level of consumption we need to take into account the market value of nonhuman wealth, the interest rate, and current and future wages. In a stochastic setting the distribution of future wages could be correlated with the value of nonhuman wealth, marketed and unmarketed. In particular, one might expect workers observing prosperity (high market value of wealth) to raise their forecasts of future wages. If we take into account that lifetime labor supply is chosen along with consumption levels, it is far from clear what sort of consumption behavior one ought to expect to see associated with movements in the market value of wealth.[5]

With enough simplifying assumptions, though, one can derive from the general approach outlined above the conclusion that a person's current consumption will be a function of his forecasted labor earnings and current wealth, for example,

$$C_t = aE_t[w_{t+1}L_{t+1}] + bW_t,$$

where a and b are constants, E_t is the expectation conditional on information at time t, and W_t is the (stochastic) market value of nonhuman wealth.[6] Such a model will generate a time path of consumption and wealth, and hence of saving, defined as the change in wealth. The point to emphasize here is that such regularity as the models do lead us to look for is in the relationship among consumption, labor earnings, and wealth at *market value.*

1.2.2 Net Worth as an Accounting Idea

We can capture in a crude way the role for financial accounting in the simple model of behavior by adding an explicit, real asset, say a certain number of machines, M_1, as another element of endowment. In the typical financial accounting context, there is no readily observable market for fixed capital. Assume, therefore, that the machines are inalienable (i.e., they cannot be sold). The number of machines is tracked by the financial accounts. A machine generates output $\tilde{O}$ in period 2 ($\tilde{O}$ would be stochastic in a realistic model). Then the budget constraint is expressed by equations (4) and (5); the single-constraint version that eliminates the financial assets carried over is expressed by (6).

$$C_1 + B_2p_2 = w_1 + B_1p_2. \tag{4}$$

$$C_2 = w_2 + \tilde{O}M_1 + B_2. \tag{5}$$

$$C_1 + C_2p_2 = w_1 + w_2p_2 + B_1p_2 + \tilde{O}M_1p_2. \tag{6}$$

It is evident from (6) that, in a world of certainty, with unlimited borrowing and lending of the financial asset, the only use of the financial accounting

information is to provide a basis for estimating what the market value of the machines would be ($\tilde{O}M_1p_2$). If one knows the market value of the machines, the accounting information is superfluous.

Complicating the model by introducing an explicit treatment of uncertainty and asymmetries of information does not suggest a further role for financial accounting information. With complete Arrow-Debreu contingent claim markets, the market value of wealth continues to define the position of the budget constraint. Owing to the increased number of prices, ambiguities about the signs of derivatives multiply in welfare comparisons or positive predictions of the effect of changes in parameters on consumption or labor supply. Missing markets, asymmetries, liquidity constraints, and the like render budget sets nonlinear and reduce the information contained in any single parameter, such as initial wealth, of the individual's problem. Nevertheless, there does not appear to be a general role for accounting information except as the basis for estimating implicit market values.

The function of financial accounting for a business firm is not to duplicate market valuation. A clear statement of this point is presented in an official pronouncement of the Financial Accounting Standards Board: "Financial accounting is not designed to measure directly the value of a business enterprise, but the information it provides may be helpful to those who wish to estimate its value" (Financial Accounting Standards Board, 1978, as excerpted in Gibson and Frishkoff, 1986, 19). Financial accounting for asset value and market value converge where there is an actual transaction that renders the market value objectively measurable. Between transactions, accounting rules prescribe transformations (depreciation, amortization, etc.) of the original market-value data to describe the stock of assets involved.

It is tempting, and I think even usual among economists, to attribute to the accounting measure of net worth (appropriately corrected to some sort of replacement-cost basis) the status of a kind of "permanent income" measure, a stationary point in the noisy world of asset revaluations. I am not aware, however, of any empirical evidence in support of this characterization of accounting net worth in relation to the valuation of firms (nor of the related characterization of accounting depreciation).[7]

There are really two reasons we should expect accounting values to differ from market values of firms. First, accounting practices clearly lay no claim to tracking the market values of those assets that are carried on the books. Thus, for example, the depreciated accounting value of fixed investment neither is, nor claims to be, a stand-in for market value for the assets involved.[8] Intangible assets acquired by purchase are generally amortized according to formula.[9] Depreciation or amortization deductions for retirements from the stock of assets, based on the amounts paid for the assets, are needed to account for the fact that *some* systematic effect can be expected with the passage of time. These allowances are, to be sure, based on experience with the physical or otherwise determined useful lives of similar assets in the past, but to serve their purpose they must be formally prescribed in accounting rules.

They do not refer to assessments of current market value in the context of the firm, which may deviate up or down from the path implied by accounting rules of thumb.

Second, important intangible assets created by the activities of a firm (i.e., not bought from another firm) are typically not carried on the balance sheet at all. As is well known, research and development and advertising outlays are expensed currently. Successful efforts do not generate assets on the books unless there is an actual transaction, such as a sale of patent rights. The value of a firm that discovered the laser or the transistor and could appropriate the resulting value would surely jump in market value. Its accounting net worth, however, would not change. The same is true for an economy under NIPA capital accounting practices. Since the inventor of a new idea may have difficulty capturing the rents, there is a better basis for excluding the value increase from company books than for excluding it from a national aggregation. Technological and market surprises of many kinds (oil price shocks, technological breakthroughs, discovery of a new oil field) are excluded from company books and from NIPA income and capital accounts. Observation of the histories of firms such as computer, automobile, and pharmaceutical companies makes clear that large movements in value are associated with the success or failure of ideas (including marketing) and organizational innovations. Such value changes are clearly of great quantitative significance, quite stochastic, and weakly, if at all, related to investment in fixed capital.

In short, the accounting net worth of the firm is a measure of *some* of its past inputs. It represents the solution to an intractable statistical problem: how to aggregate information about financial commitments through time embodied in property of one sort or another. It is not a shortcoming of accounting net worth that it does not perfectly match the valuation of the firm by those making use of accounting information. Accounting data are designed to inform, rather than duplicate, market evaluation.[10]

1.2.3 NIPA Saving and Investment

Gross investment in the national income and product accounts is the sum of net exports of goods and services (as emphasized by Eisner and Pieper 1989, a measure of the accumulation of claims on foreigners, not a measure of the change in market value of net claims on foreigners), business expenditures on fixed investment (structures, including residential structures, and producers' durable equipment), and the change in business inventories. If we think of gross national product as a flow of physical goods and current services, we can think of gross investment as the portion of that flow devoted to adding to the stock of wealth. This may be an interesting measure; it is arguably the appropriate horizontal axis on a marginal efficiency of investment schedule. (This is not the place to develop the point, but it may be that a market value aggregate belongs in a production function for SHS income. When a firm purchases a piece of real estate for a "revalued" price, presumably it expects

to obtain as much extra value of output as it does when it constructs a new building for the same amount.)

It is a further issue whether there is a useful aggregate, called the capital stock, that can be sensibly employed in a production function.[11] The idea that there is such an aggregate that generates a flow of productive services underlies the capital stock figures compiled by the Bureau of Economic Analysis. Although value data provide the starting point, like GNP itself, the capital stock is conceived of as a physical quantity. The depreciation estimates ("capital consumption allowances with capital consumption adjustment") in the NIPA are intended to capture the loss over time in the current productive service flow potential embodied in the accumulation of fixed investment. Other things equal, we might expect the profitable investment opportunities to increase with increases in depreciation allowances, which would signal the need for "replacement" investment. If this model captures the essence of the flow of investment opportunities, it is net investment, not gross, that belongs on the horizontal axis of a marginal efficiency of investment schedule.

NIPA depreciation allowances are not intended to represent the decline in market value of the assets in question and would not do so even if there were no measurement problems except under very special assumptions about the time path of discount rates and about the way productive capacity of the assets declines over time. (Basically, what is required is constancy of discount rates and exponential decay of productivity.[12]) The actual rules used in constructing the depreciation allowances are rooted in studies of retirement and other measures of physical life.[13]

"Economic depreciation" is defined to be the decline in market value of a piece of equipment or a structure between the beginning and end of the accounting period. As it happens, Hulten and Wykoff (1981) have concluded that the U.S. Department of Commerce capital consumption estimates are reasonably similar to the average historically experienced economic depreciation for a subset of assets for which there is an active second-hand market. It is difficult to know, however, how relevant such ex post data on a subset of assets are to the forward-looking market valuation of the bolted-down assets of business firms. A striking implication of the data in table 1.1 and figures 1.1 and 1.2, taken at face value, is that the NIPA capital consumption allowances for the nonfinancial corporate sector differed sharply and unsystematically from economic depreciation over the 1948–87 period.[14] (I take up below some of the reasons one might not take the figures at face value.)

1.3 Objections to the Use of Market-Value Measures of Saving

Various objections are sometimes raised to the use of asset market-value data, rather than NIPA measures, in analyzing saving.

1. Asset markets are too volatile. They register paper gains and losses, not the steady accumulation of real things.

To a degree that seems often unappreciated, the determinants of wealth are psychological. We need only be reminded of Ponzi schemes and tulip manias, not to mention stock market crashes, to bring home how dependent asset values are upon beliefs about the future. The modern literature on the rationality of expectations and the efficiency of pricing in asset markets has emphasized in a refined way the unpleasant difficulty of rooting asset values in "fundamentals."

Asset valuation is also inherently dependent upon the structure of information. I like to illustrate this dependence with the case of a building that is destined to be destroyed by a meteor on a certain date. As long as no one knows when and where the meteor will strike, the building has the same value as others like it. At the moment the astronomers make public a prediction, the building loses value (to a degree dependent on the distance into the future of the catastrophic event and on the confidence the public places in astronomers' forecasts). It is clear that the owner of the structure suffers a fall in wealth at the point the information is revealed, and presumably we would say that "society" suffers the same fall in wealth, even though, in a sense, nothing is changed by the knowledge that causes the loss in value. The meteor was going to crash into the building in any case.[15]

An interesting intermediate case arises if the information about the future is revealed only to the owner of the building. (The analogous situation is not unusual—it gives rise to the "lemons" problem.) If he keeps the matter a secret and sells the structure, he suffers no loss, nor is there any observable private or social loss until the meteor strikes.

As the examples suggest, the market value of assets has a kind of ephemeral quality that may, for example, lead to doubts about the efficacy of capital markets as institutions of resource allocation.[16] Unfortunately, the ephemeral quality of market assessments of value does not alter the role implied for them in economic theory. Real risk and uncertainty about the future are apparent facts of life that cannot be avoided by focusing on inputs that can be measured with relative precision. The purpose of asset measures produced by financial accountants is to assist in the estimation of market values. The usual argument applies that the market price will incorporate whatever information the accounting data contain. There is, presumptively, no money to be made by betting on accounting net worth against the market.[17]

2. Asset market value changes incorporate price effects. What we need are real saving and wealth stock concepts that are independent of discount rates and other relative asset value changes.

Various examples suggest the importance of taking into account price effects, especially in using wealth measures to draw conclusions about welfare. One of the most important is the effect of changes in the discount rate. At any moment the stock of claims to future goods and services is heterogeneous with respect to the time and contingencies under which the claims pay off. When

the prices of future consumption claims change, so does the value of an unchanged stock of assets. In his discussion of the concept of income, Hicks (1946) favored a wealth measure that would be unchanged if the steady-state level of consumption did not change.

The increasing site value of land that we might expect to accompany population growth provides another example. When the value of all houses (including mine) increases, I may be no better off, in spite of my higher wealth, because I have to live somewhere. A third example was suggested to me by John Shoven: discovery of a new technology that made computers of enormous power virtually costless and instantaneously producible would render the existing stock of computers valueless (while we are at it, assume that all software transfers costlessly to the new machines).

These are index number problems of the classic sort.[18] A financial accounting measure of saving appears attractive in the particular instances because they seem to call for no change in the real-wealth measure in the face of actual changes in market value. (I have not actually tried to sort out whether a real-wealth measure would not change in the examples.) But this is surely fortuitous. Dealing with the index number problem requires transforming market-value data, and it is only by chance that financial accounts may sometimes give the right answer.

The discount-rate change problem is a particularly important one. When we assess performance, it would make sense to look at both wealth and discount rate data. There is no basis, however, for presuming that financial accounting measures of wealth perform adequately as indices of real wealth.

3. There are no reliable data on market value of wealth, therefore, we have to use the NIPA saving measures.

There may be problems with existing data on market values, although very extensive and accurate data are available on assets such as corporate equities. The National Balance Sheets data seem to me an underexploited resource. Furthermore, as in other contexts, an objection such as this one should be grounds for devoting efforts to improving the data and to establishing the adequacy of the proxies we use if direct measurements are not at hand.

1.4 Time-Series Data on Wealth at Market Value

Figures derived from the National Balance Sheets cast doubt on the adequacy of NIPA saving measures as a proxy for changes in the market value of assets. Table 1.2 shows the time series of various wealth aggregates. The nominal dollar figures have been reduced to common units using the implicit GNP deflator (taking the average of fourth- and first-quarter values to approximate the year-end figure corresponding to the balance sheet observations). The aggregate net worth of households includes the market valuation of corporate shares and of land. The National Balance Sheets value fixed investment

Table 1.2 Household Net Worth and Aggregate Wealth, 1948–87

Year	Net Worth of U.S. Households (millions $1982)	Government Net Worth (millions $1982)	Aggregate Wealth at Market (millions $1982)	Aggregate Saving (millions $1982)	Aggregate Saving to GNP (%)
1948	3,487,654	−857,494	2,630,160		
1949	3,671,501	−889,339	2,782,162	152,002	13.7
1950	3,883,883	−819,665	3,064,218	282,056	23.4
1951	4,189,833	−790,067	3,399,766	335,548	25.3
1952	4,287,324	−795,849	3,491,475	91,709	6.6
1953	4,377,281	−825,250	3,552,031	60,556	4.2
1954	4,687,899	−840,255	3,847,644	295,613	20.9
1955	4,938,926	−814,882	4,124,044	276,400	18.5
1956	5,075,169	−780,335	4,294,834	170,791	11.2
1957	4,984,653	−770,061	4,214,592	−80,242	−5.2
1958	5,427,604	−806,349	4,621,255	406,663	26.4
1959	5,571,610	−809,815	4,761,795	140,541	8.6
1960	5,680,642	−808,103	4,872,539	110,744	6.7
1961	6,086,197	−824,849	5,261,347	388,808	22.8
1962	5,928,471	−832,285	5,096,186	−165,161	−9.2
1963	6,274,049	−833,201	5,440,848	344,662	18.4
1964	6,576,652	−837,694	5,738,958	298,110	15.1
1965	6,871,566	−823,076	6,048,490	309,532	14.8
1966	6,833,612	−806,728	6,026,885	−21,605	−1.0
1967	7,370,297	−831,246	6,539,050	512,166	22.5
1968	7,827,453	−825,822	7,001,631	462,581	19.6
1969	7,493,648	−790,676	6,702,972	−298,659	−12.3
1970	7,432,952	−790,358	6,642,595	−60,377	−2.5
1971	7,752,823	−817,570	6,935,254	292,659	11.8
1972	8,190,783	−815,700	7,375,083	439,829	16.9
1973	7,889,046	−758,254	7,130,791	−244,291	−8.9
1974	7,457,661	−712,663	6,744,998	−385,793	−14.1
1975	7,830,318	−794,411	7,035,907	290,909	10.8
1976	8,348,919	−834,194	7,514,726	478,819	16.9
1977	8,642,746	−837,706	7,805,040	290,315	9.8
1978	9,111,741	−816,502	8,295,239	490,198	15.7
1979	9,631,709	−784,075	8,847,635	552,396	17.3
1980	10,046,585	−790,784	9,255,800	408,166	12.8
1981	10,064,616	−812,292	9,252,323	−3,477	−0.1
1982	10,061,786	−925,358	9,136,427	−115,896	−3.7
1983	10,544,681	−1,067,194	9,477,487	341,060	10.4
1984	10,731,277	−1,188,518	9,542,759	65,272	1.9
1985	11,372,752	−1,328,645	10,044,108	501,349	13.9
1986	11,907,562	−1,473,725	10,433,837	389,729	10.5
1987	12,257,233	−1,596,916	10,660,317	226,480	5.9

Source: See text. Based on Board of Governors of the Federal Reserve System (1984); U.S. Department of Commerce (1986, 1987).

owned directly (in unincorporated businesses and in the form of owner-occupied housing and consumer durables) at replacement cost (using the NIPA data).[19]

The column titled "Government Net Worth" in table 1.2 is simply the aggregate debt of local, state, and federal governments held by the public (of course, it is a negative number). Government debt is, directly or indirectly, included on the asset side of household balance sheets: to avoid double counting, the column headed "Aggregate Wealth at Market" sums the household and government net worth to produce an aggregate wealth measure. Notice that no attempt at all has been made to evaluate the real asset position of governments.[20]

The difference in aggregate wealth from one year to the next gives us "Aggregate Saving" in table 1.2. Given what we know about the volatility of the stock and real property markets, we should expect significant volatility in the wealth and saving measures, and we find it. Figure 1.3 displays the wealth time series graphically, and figure 1.4 shows the saving series, normalized by dividing by GNP. For comparison, as described numerically in table 1.3, figure 1.4 also displays the ratio of net national saving to GNP, a figure derived from the national income and product accounts. As we might expect, the market-value measure is much more variable than the NIPA measure. The measure based on the National Balance Sheets oscillates over a range from a low of almost -15 percent to a high of almost 25 percent of GNP. The NIPA

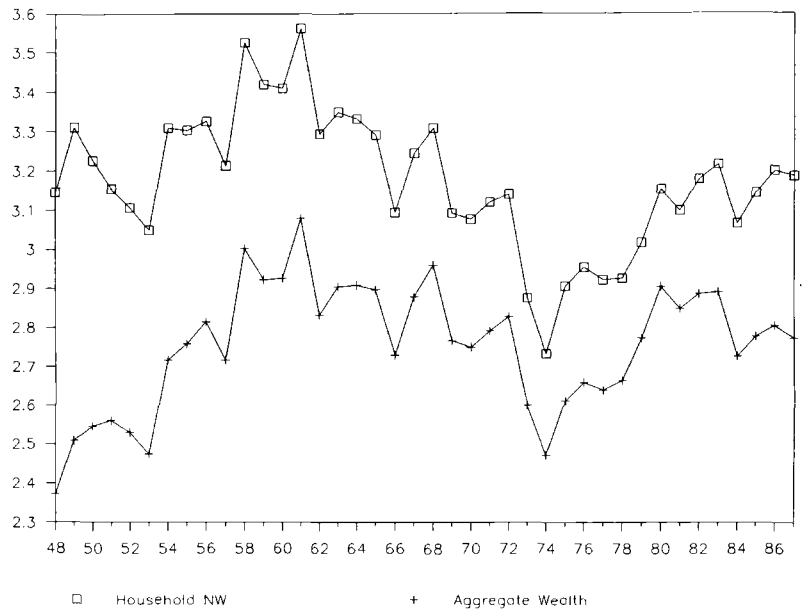

Fig. 1.3 Household and aggregate wealth, 1948–87, ratio to GNP

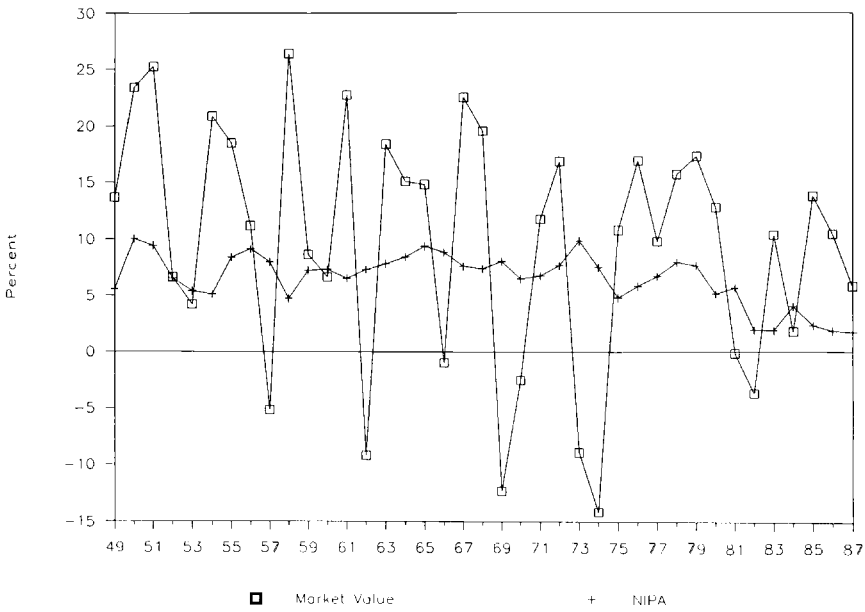

Fig. 1.4 Market value and NIPA saving, 1949–87, ratio to GNP

measure drifts from a high of 10 percent in 1949 to a low of 2 percent in 1987. The two series are very different.

Fluctuations in market value are not all that accounts for the difference between the two measures. In particular, the National Balance Sheets concept includes the stock of consumer durables in wealth. The National Balance Sheets include estimates of the "consolidated net assets" of the United States, consisting of the sum of reproducible assets (including consumer durables), land at market value, U.S. gold and special drawing rights (SDRs), and certain claims on foreigners.[21] Subtracting government debt and excluding land from this total and taking the difference from year to year gives us a saving figure purged of market revaluations. It consists mostly of reproducible assets: residential structures, nonresidential plant and equipment, inventories, and consumer durables. It thus differs from NIPA net national saving mainly in inclusion of consumer durables, and, in avoiding the inclusion of market revaluations, it is conceptually directly comparable to NIPA saving. Indeed, the figures are taken from the Bureau of Economic Analysis tangible-wealth tabulations. To emphasize that this hybrid series is derived from financial accounting data (although it is far from the historical-cost book values on firms' balance sheets), I refer to it as "'Book' less Land" in figure 1.5 (fig. 1.5 simply adds the new series to fig. 1.4).

Although the resulting series is smoother than that of aggregate wealth, significant differences from NIPA national saving remain. Exploration of the

Table 1.3 **Net National Saving in the United States, NIPA Basis, 1948–87, Ratio to GNP (in percentages)**

Year	Gross Saving	Capital Consumption Allowances	Net Saving
1948	19.4	7.8	11.6
1949	14.0	8.4	5.6
1950	18.2	8.2	10.0
1951	17.6	8.2	9.4
1952	14.9	8.3	6.6
1953	13.7	8.3	5.4
1954	13.9	8.7	5.1
1955	16.9	8.5	8.4
1956	18.1	8.9	9.2
1957	17.1	9.1	8.0
1958	14.1	9.4	4.8
1959	16.2	9.0	7.2
1960	16.3	9.0	7.3
1961	15.5	9.0	6.5
1962	15.9	8.6	7.3
1963	16.3	8.5	7.8
1964	16.7	8.3	8.4
1965	17.5	8.1	9.4
1966	16.9	8.0	8.8
1967	15.9	8.3	7.6
1968	15.6	8.3	7.4
1969	16.5	8.4	8.0
1970	15.2	8.7	6.5
1971	15.6	8.8	6.7
1972	16.5	8.9	7.7
1973	18.5	8.7	9.8
1974	16.8	9.3	7.5
1975	14.9	10.1	4.8
1976	15.9	10.1	5.8
1977	16.9	10.1	6.7
1978	18.2	10.2	7.9
1979	18.3	10.6	7.7
1980	16.3	11.1	5.2
1981	17.1	11.4	5.7
1982	14.1	12.1	2.0
1983	13.6	11.6	2.0
1984	15.1	11.0	4.1
1985	13.3	10.9	2.4
1986	12.7	10.8	1.9
1987	12.4	10.6	1.8

Sources: 1948–84: *Economic Report of the President,* February 1988; 1985–87; *Survey of Current Business,* July 1988.

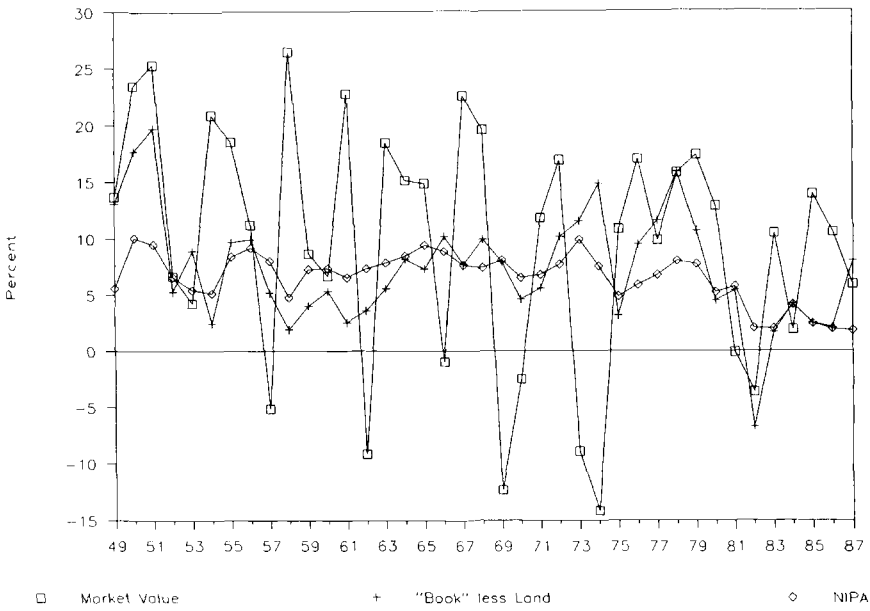

Fig. 1.5 Comparison of saving measures, 1948–87, ratio to GNP

reasons for the remaining differences would be a side excursion from my principal line of argument. The evidence from the National Balance Sheets data clearly supports the conclusion that financial accounting saving misses significant amounts of the value change that is revealed in asset markets.

1.5 Caveats on the National Balance Sheets Wealth Figures

Several problems with the National Balance Sheets data should be recognized.

1. The market value of equity incorporates the capitalized value of certain variations in tax liabilities that are not balanced by offsetting measured asset values. An instance is the "trapped-equity" problem.[22] Corporate payouts in the form of dividends are subject to tax at the shareholder level, and shareholders ought to discount this tax in bidding for shares. A considerable (and inconclusive) literature now exists developing the technical ins and outs of the tax and securities law and practice in relation to the trapped-equity argument. To the extent that dividend taxes are discounted in the price of equity, the value of a corporation's shares will be below the market value of the assets owned by the firm.

Another instance is the value of tax liabilities accrued by corporations via such tax rules as accelerated depreciation. An increase in such accruals ought to lower the value of corporate equities.[23]

A possible third instance is the tax consequence of changing corporate financial structure. The tax system has set up incentives, which have varied through time, bearing on the choice between debt and equity. One view of the current intense leveraged-buyout activity in the United States is that it is strongly motivated by such tax considerations, and the gradual realization of the private profit (at the expense of public revenue) to be made by financial restructuring accounts for some of the bidding up of equity prices.

There is, in all of these instances, a balancing asset "owned" by the public through the public's "ownership" of the government, which we might describe as accrued tax liability. Unfortunately, however, we cannot observe the value of this asset in the market, and so the empirical problem does not go away with aggregation across sectors.

2. Anticipated tax claims are also important in assessing pension reserve assets, which are viewed as belonging to households. Presumably, the great bulk of these claims is subject to income taxation upon distribution. When household and government financial claims are netted in reaching a national wealth figure, this problem goes away.

3. As Auerbach (1985) has emphasized, unfunded pension liabilities of corporations represent unmeasured assets of the households that are presumably offset by an effect on measured corporate equity value in the market. This component of wealth is missed in the National Balance Sheets.

4. Debt is carried on the National Balance Sheets at book value. Corporate debt liabilities are thus incorrectly valued. Correcting for inflation, of course, is relatively easy. But there is also a divergence between book and market value in current dollars that varies through time. Tax incentives plus simple changes in the nominal discount rates result in such divergences. Furthermore, the leveraged buyout wave may be responsible for a systematic divergence between book and market valuation of debt. The large premiums paid for equity claims in corporate takeovers are sometimes explained by the implied expropriation of the interests of bondholders. The value of the bonds of RJR Nabisco is said to have fallen by 20 percent as a consequence of the successful takeover of the firm in a leveraged buyout in December 1988.

It might be thought that the misstatement of the value of bonds as liabilities on the books of corporations would be balanced by their misstatement as assets in the hands of the public in an aggregation across sectors. This would be so if the aggregation were in terms of financial accounting concepts. But aggregation to national saving will sum the market values of equity with the book value of debt. To correct for this problem will require gathering data on the market value of bonds. (Brainard, Shoven, and Weiss, 1980 have developed such estimates for the debt of a large population of U.S. corporations.)

5. I have mentioned above the likelihood that some of the recent increase in equity value has come at the expense of bondholders and of the government (through lost tax revenues otherwise expected). Shleifer and Summers (1987) have suggested that other "stakeholders" in corporations have also lost wealth

in the wave of corporate acquisitions. We would probably describe the wealth effects on noncorporate, nonbondholder stakeholders as impacts on human capital; the effects are in any case presumably not reflected in asset market data.

6. The National Balance Sheets present no estimates of the market value of businesses owned directly by households. The data in table 1.1 show a large and variable divergence between book and market values of property owned by corporations. There is no obvious reason there should not be a similar degree of divergence in the valuation of noncorporate firms.

7. The Flow of Funds staff of the Federal Reserve Bank expresses reservations about the adequacy of the estimated market value of land, which is built up using ratios of assessed to market values from real estate tax administration reported in censuses of governments taken once every five years. I have no independent basis for evaluating these reservations. (Corporate holdings are presumably captured in equity values, but corporations own a small fraction of U.S. land.)

1.6 The Saving Performance of the United States

It is usual to assess aggregate saving behavior by reference to saving "rates," ratios of saving to aggregate income. Although dividing the aggregate saving by a national income measure is a natural method of normalizing for the size of the economy, one should be cautious in drawing conclusions about economic performance from trends in, or comparisons across countries of, such ratios. Saving rates thus defined do not obviously relate to the objective of assessing the level of aggregate consumption against a standard either of consistency with past behavior or of prudence with respect to future welfare. For these purposes, measures of wealth per capita are called for or, more generally, measures of the wealth of various subgroups in the population.[25]

Table 1.4 displays wealth per capita data for the United States, where wealth is interpreted in the National Balance Sheets sense of household net worth (at market value) minus government debt. Saving per capita is simply the first difference of wealth per capita, and thus incorporates population growth. Figure 1.6 displays the saving series expressed as the year-to-year growth of wealth per capita (labeled "Growth in Wealth per Capita" in table 1.4).Because wealth is a stochastic variable, a particular year's experience conveys limited information.

It is not clear what one should regard as either a normal or a "good" rate of increase in wealth per capita. If productivity were stationary we would probably expect wealth per capita to be constant, and welfare considerations would also presumably prescribe constancy. In general, both predicted and optimal accumulation would be related to technological progress and demographic structure. As shown in figure 1.6, there appears to be a long-term

Table 1.4 Per Capita Wealth and Saving at Market Value, 1948–87

Year	Wealth per Capita ($ 1982)	Saving per Capita ($ 1982)	Growth in Wealth per Capita (%)
1948	17,937		
1949	18,649	711	4.0
1950	20,123	1,475	7.9
1951	21,951	1,828	9.1
1952	22,161	209	1.0
1953	22,175	14	.1
1954	23,601	1,427	6.4
1955	24,854	1,253	5.3
1956	25,428	574	2.3
1957	24,506	−922	−3.6
1958	26,425	1,919	7.8
1959	26,777	352	1.3
1960	26,969	192	.7
1961	28,642	1,673	6.2
1962	27,320	−1,323	−4.6
1963	28,751	1,431	5.2
1964	29,908	1,157	4.0
1965	31,129	1,221	4.1
1966	30,662	−467	−1.5
1967	32,907	2,245	7.3
1968	34,885	1,978	6.0
1969	33,072	−1,813	−5.2
1970	32,395	−678	−2.0
1971	33,397	1,002	3.1
1972	35,137	1,740	5.2
1973	33,650	−1,487	−4.2
1974	31,540	−2,110	−6.3
1975	32,578	1,038	3.3
1976	34,466	1,888	5.8
1977	35,439	973	2.8
1978	37,268	1,829	5.2
1979	39,313	2,045	5.5
1980	40,639	1,326	3.4
1981	40,203	−436	−1.1
1982	39,293	−910	−2.3
1983	40,364	1,071	2.7
1984	40,265	−100	−.2
1985	41,977	1,712	4.3
1986	43,184	1,208	2.9
1987	43,705	521	1.2

Sources: See text. Based on Board of Governors of the Federal Reserve System (1984); U.S. Department of Commerce (1986, 1987).

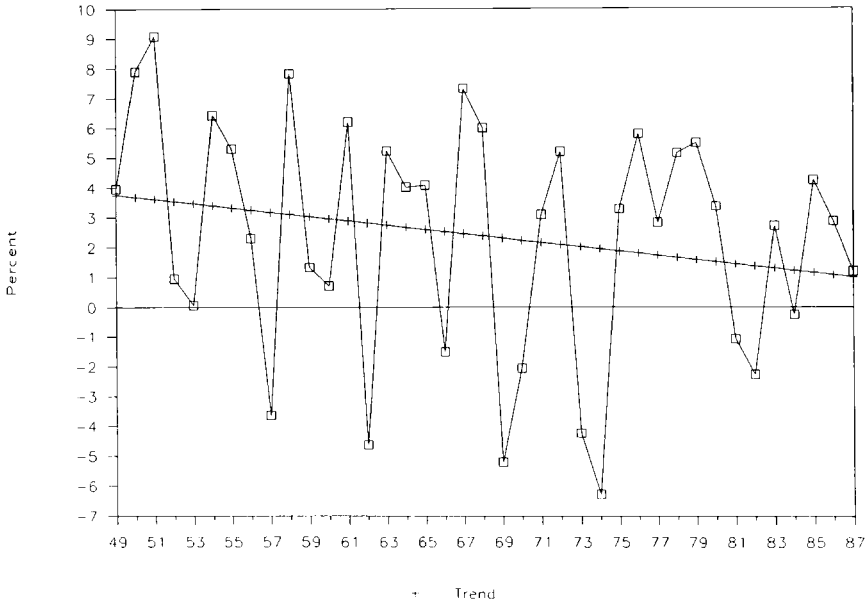

Fig. 1.6 Growth in household net worth less government debt per capita, 1949–87

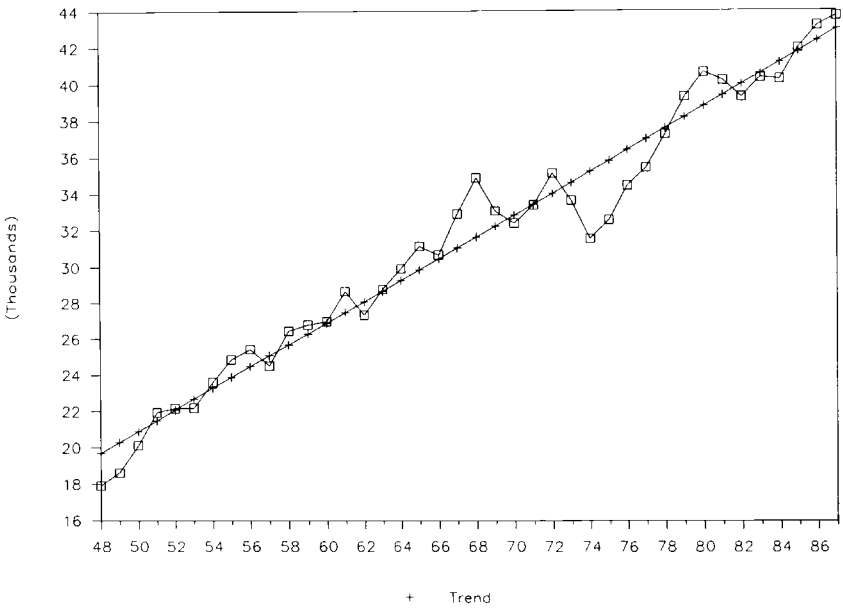

Fig. 1.7 Household net worth less government debt, 1982 dollars per capita

declining trend to the rate of growth of real wealth per capita. Interestingly, the performance of the most recent three years is on or slightly above trend.

For those looking for good news (bearing in mind the caveats mentioned above about the use of wealth as a measure of welfare), figure 1.7 displays the trend in real wealth per capita. The picture shows that, on average, since 1948 U.S. residents have been adding to the stock of wealth per capita about $700 (1987 price level) per year. According to figure 1.7, the current level of wealth per capita is just a bit above its long-term trend.

1.7 Conclusion

Although the NIPA saving measures, and especially NIPA saving rates, are widely used in both scholarly and journalistic treatments, their shortcomings as representations of the saving concepts derived from economic analysis should not be controversial among economists. Saving is the change in a stock of wealth. NIPA saving describes the change in a cost-based measure of some past resource commitments. Households, individually and in the aggregate,measure their situations instead by reference to a forward-looking assessment of the success or failure of those and other resource commitments. These assessments find expression in the capital market's valuation of enterprises, broadly conceived. The annual change in that value is the measure of saving.

Whatever their usefulness as measures of a certain class of inputs, the NIPA saving and wealth measures are not good proxies for the market-expressed assessments of results. The National Balance Sheets present the conceptually appropriate measures of national wealth and saving. It is clear, though, that much needs to be done to improve the quality of the statistics and to refine their interpretation.

Notes

1. For discussions of the SHS income concept, see Bradford (1986) or Institute for Fiscal Studies (1978).

2. For this purpose, owner-occupiers can be thought of as in the business of providing housing services. Other household-owned and household-employed capital (consumer durables) is excluded from the NIPA investment and capital concepts, but that is not my main concern here.

3. To derive the aggregate accounting net worth of the corporate sector, I have added the net worth of corporate farms (line 46 of the Sector Balance Sheet for the Nonfinancial Business Sector) to the nonfarm, nonfinancial total (line 43).

4. The importance of intertemporal prices (interest rates) is often overlooked in assessments of welfare. Summers (1983) develops a cost-of-living series corrected for interest rate changes, applicable to a person with a given amount of wealth (and no anticipated earnings).

5. For examples of more refined intertemporal models see Breeden (1979), Campbell and Deaton (1988), Ingersoll (1987, Chap. 11), Merton (1971, 1973).

6. For a classic example of such a model, see Ando and Modigliani (1963). For recent examples, see Blinder and Deaton (1985), Deaton (1987), Hall (1978, 1988), West (1988).

7. See Beaver and Ryan (1985).

8. See Gibson and Frishkoff (1986, 44).

9. See Gibson and Frishkoff (1986, 46).

10. See Foster (1986) for a survey of the accounting literature on the information content of financial statements.

11. For an overview see Brown (1980).

12. See the clear discussion in Hulten and Wykoff (1981).

13. See U.S. Department of Commerce, Bureau of Economic Analysis (1987); also Musgrave (1983, 1986a, 1986b).

14. Using National Balance Sheets data, Bulow and Summers (1984) have emphasized this point in their discussion of the failure of income tax rules to recognize wealth changes in the form of asset revaluations. They suggest that the ex ante depreciation allowances for tax purposes should be increased to compensate the investor for the risk of asset revaluations that are unrecognized by the tax rules.

15. James Poterba has reminded me that, quite apart from discounting, the aggregate market value of wealth may not fall by the full prior value of the doomed building when the meteor news arrives. The aggregate value will depend upon the general equilibrium response of all asset prices, even if the asset in question is a tiny part of the aggregate stock. Bradford (1978) illustrates the point.

16. See Stiglitz (1972, 1979).

17. Summers (1986) has emphasized how difficult it may be to establish the "rationality" of asset markets, i.e., to tell whether one can make money be selling short when prices are too high by some internal standard. But presumably those who would use NIPA saving figures rather than asset market values are not talking about small, hard-to-detect, effects.

18. Pollak (1975) has worked out the index number theory applicable to an intertemporal setting. See also Summers (1983).

19. The figures for household net worth (sector basis) included in this paper incorporate an adjustment to deal with an error discovered in the course of this work by Frederick O. Yohn, Jr., of the Flow of Funds section of the Federal Reserve Board. In the published series, household claims on noncorporate private financial institutions have been omitted from household net worth. I have added the "approximate share of noncorporate companies" in the net worth of the private financial institution sector (line 50 in the Sector Balance Sheet of Private Financial Institutions) to the published household sector net worth.

20. Boskin, Robinson, and Huber (1987) and Eisner (1986) have developed government real asset series.

21. Perhaps because it is not clear how one would allocate accounting values, the National Balance Sheet's "total consolidated net assets" of the United States excludes U.S. holdings of foreign equities and makes no deduction for foreign holdings of U.S. equities (other than via direct investment). The household sector net worth does include holdings of foreign equities. The two wealth concepts are thus not quite parallel.

22. See Auerbach (1979, 1983b) and Bradford (1981).

23. Auerbach (1983a, 1989) and Auerbach and Hines (1987) show that the capitalized value effects of tax law changes can be large.

24. Kotlikoff (1984, 1986, 1988) has emphasized a similar point with respect to assessment of the national debt.

References

Ando, Albert, and Franco Modigliani. 1963. The "Life-Cycle" Hypothesis of Saving: Aggregate Implications and Tests. *American Economic Review* 53 (May): 55–84.

Auerbach, Alan J. 1979. Wealth Maximization and the Cost of Capital. *Quarterly Journal of Economics* 93:433ff.

———. 1983a. Corporate Taxation in the U.S. *Brookings Papers on Economic Activity*, No. 2.

———. 1983b. Taxation, Corporate Financial Policy, and the Cost of Capital. *Journal of Economic Literature* 21:905–40.

———. 1985. Saving in the U.S.: Some Conceptual Issues. In *The Level and Composition of Household Saving*, ed. Patric Hendershott. Cambridge, Mass.: Ballinger.

———. 1989. Tax Reform and Adjustment Costs: The Impact on Investment and Market Value. *International Economic Review* 30 (November): 939–62.

Auerbach, Alan J., and James R. Hines, Jr. 1987. Anticipated Tax Changes and the Timing of Investment. In *The Effects of Taxation on Capital Accumulation*, ed. Martin Feldstein. Chicago: University of Chicago Press.

Beaver, William H., and Stephen Ryan. 1985. Do Statement Thirty-three Earnings Explain Stock Prices? *Financial Analysts Journal* 61, no. 5 (September–October): 66–71.

Blades, Derek W., and Peter Sturm. 1982. The Concept and Measurement of Savings: The United States and Other Industrialized Countries. In *Saving and Government Policy*. Boston: Federal Reserve Bank of Boston.

Blinder, Alan S., and Angus S. Deaton. 1985. The Time Series Consumption Function Revisited. *Brookings Papers on Economic Activity*, no. 2, 465–511.

Board of Governors of the Federal Reserve System. 1988. *Balance Sheets for the U.S. Economy, 1948–87*. Washington, D.C., October.

Boskin, Michael J. 1986. Theoretical Issues in the Measurement, Evaluation and Interpretation of Postwar U.S. Saving. In *Savings and Capital Formation*, ed. F. Gerald Adams and Susan M. Wachter, 11–43. Lexington, Mass.: Lexington Books.

———. 1988. Issues in the Measurement and Interpretation of Saving and Wealth. NBER Working Paper no. 2633. Cambridge, Mass., June.

Boskin, Michael J., and Lawrence J. Lau. 1988. An Analysis of Postwar U.S. Consumption and Saving. Center for Economic Policy Research, Stanford, Calif., August. Mimeograph.

Boskin, Michael J., Marc S. Robinson, and Alan M. Huber. 1987. Government Saving, Capital Formation and Wealth in the United States, 1947–85. In *The Measurement of Saving, Investment, and Wealth*, ed. Robert E. Lipsey and Helen Stone Tice, 287–353. NBER Studies in Income and Wealth, vol. 52. Chicago: University of Chicago Press.

Bradford, David F. 1978. Factor Prices May Be Constant but Factor Returns Are Not. *Economics Letters* 1:199–203.

———. 1981. The Incidence and Allocational Effects of a Tax on Corporate Distributions. *Journal of Public Economics* 15: 1–22.

———. 1986. *Untangling the Income Tax*. Cambridge, Mass.: Harvard University Press.

Brainard, William C., John B. Shoven, and Laurence Weiss. 1980. Financial Valuation of the Return to Capital. *Brookings Papers on Economic Activity* no. 2, 453–511.

Breeden, Douglas T. 1979. An Intertemporal Asset Pricing Model with Stochastic

Consumption and Investment Opportunities. *Journal of Financial Economics* 7 (September): 265–96.

Brown, Murray. 1980. The Measurement of Capital Aggregates: A Postreswitching Problem. In *The Measurement of Capital*, ed. Dan Usher, 377–420. NBER Studies in Income and Wealth, vol. 45. Chicago: University of Chicago Press.

Bulow, Jeremy I., and Lawrence H. Summers. 1984. The Taxation of Risky Assets. *Journal of Political Economy* 42: no. 1 (February): 20–38.

Campbell, John. 1987. Does Saving Anticipate Declining Labor Income? *Econometrica* 55, no. 6 (November): 1249–73.

Campbell, John, and Angus Deaton. 1988. Why Is Consumption So Smooth? Woodrow Wilson School, Princeton University, January. Mimeograph.

Deaton, Angus. 1987. Consumers' Expenditure. In *The New Palgrave: A Dictionary of Economics*, ed. John Eatwell, Murray Milgate, and Peter Newman, 1:592–604. New York: Stockton.

Eisner, Robert. 1980. Capital Gains and Income: Real Changes in the Value of Capital in the United States, 1946–77. In *The Measurement of Capital*, ed. Dan Usher, 175–344. NBER Studies in Income and Wealth, vol. 45. Chicago: University of Chicago Press.

———. 1986. *How Real Is the Federal Deficit?* New York: Free Press.

———. 1988. Extended Accounts for National Income and Product. *Journal of Economic Literature* 26 (December): 1611–84.

———. 1989. Divergences of Measurement and Theory and Some Implications for Economic Policy. *American Economic Review* 79, no. 1 (March): 1–13.

Eisner, Robert, and Paul J. Pieper. 1989. The World's Greatest Debtor Nation. Typescript. Department of Economics, Northwestern University, January 13.

Financial Accounting Standards Board. 1978. Objectives of Financial Reporting by Business Enterprises. FASB Statement of Financial Accounting Concepts no. 1. FASB, Stamford, Conn.

Foster, George. 1986. *Financial Statement Analysis*, 2d ed. Englewood Cliffs, NJ: Prentice-Hall.

Gibson, Charles H., and Patricia A. Frishkoff. 1986. *Financial Statement Analysis*, 3d ed. Boston, Mass.: Kent Publishing.

Goldsmith, Raymond W. 1982. *The National Balance Sheet of the United States, 1953–1980*. Chicago: University of Chicago Press.

Hall, Robert E. 1978. Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. *Journal of Political Economy* 86 (December): 971–87.

———. 1988. Intertemporal Substitution in Consumption. *Journal of Political Economy* 96, pt. 2: 339–57.

Hicks, John R. 1946. *Value and Capital*, 2d ed. Oxford: Clarendon.

Hulten, Charles R., and Frank C. Wykoff. 1981. The Measurement of Economic Depreciation. In *Depreciation, Inflation and the Taxation of Income from Capital*, ed. Charles R. Hulten, 81–125. Washington, D.C.: Urban Institute.

Ingersoll, Jonathan E. 1987. *Theory of Financial Decision Making*. Totowa, N.J.: Rowman & Littlefield.

Institute for Fiscal Studies. 1978. *The Structure and Reform of Direct Taxation: The Report of a Committee Chaired by Professor J. E. Meade*. London: George Allen & Unwin.

Kotlikoff, Laurence J. 1984. Taxation and Savings: A Neoclassical Perspective. *Journal of Economic Literature* 22 (December): 1576–1629.

———. 1986. Deficit Delusion. *The Public Interest* 84 (Summer): 53–65.

———. 1988. The Deficit Is Not a Well-Defined Measure of Fiscal Policy. *Science* 241 (August): 791–95.

Lipsey, Robert E., and Irving B. Kravis. 1987. Is the U.S. a Spendthrift Nation? NBER Working Paper no. 2274. Cambridge, Mass., June.

Lipsey, Robert E., and H.S. Tice, eds. 1989. *The Measurement of Saving, Investment, and Wealth.* NBER Studies in Income and Wealth, vol. 52. Chicago: University of Chicago Press.

Merton, Robert C. 1971. Optimum Consumption and Portfolio Rules in a Continuous-Time Model. *Journal of Economic Theory* 3, no. 4 (December): 373–413.

———. 1973. An Intertemporal Capital Asset Pricing Model. *Econometrica* 41, no. 5 (September): 867–87.

Musgrave, John C. 1983. Fixed Reproducible Wealth in the United States, 1972–82. *Survey of Current Business* 63, no. 8 (August): 62–65.

———. 1986a. Fixed Reproducible Tangible Wealth in the United States, 1972–82, Revised Estimates. *Survey of Current Business* 66, no. 1 (January): 51–75.

———. 1986b. Fixed Reproducible Tangible Wealth in the United States, 1982–85. *Survey of Current Business* 66, no. 8 (August): 36–39.

Obstfeld, Maurice. 1986. Capital Mobility in the World Economy: Theory and Measurement. *Carnegie-Rochester Conference Series on Public Policy* 24 (Spring): 55–103.

Peek, Joe. 1986. Household Wealth Composition: The Impact of Capital Gains. *New England Economic Review* (November/December): 26–39.

Pollak, Robert A. 1975. The Intertemporal Cost of Living Index. *Annals of Economic and Social Measurement* 4, no. 1 (Winter): 179–95.

Poterba, James M. 1987. Tax Policy and Corporate Savings. *Brookings Papers on Economic Activity,* no. 2 (December): 455–503.

Poterba, James M., and Lawrence H. Summers. 1987. Recent U.S. Evidence on Budget Deficits and National Savings. NBER Working Paper no. 2144. Cambridge, Mass., February.

Ruggles, Richard, and Nancy Ruggles. 1981. Integrated Economic Accounts for the United States, 1947–1980. Institute for Social and Policy Studies Working Paper no. 84. Yale University, New Haven, Conn., October.

Shleifer, Andrei, and Lawrence H. Summers. 1987. Breach of Trust in Hostile Takeovers. NBER Working Paper no. 2342. Cambridge, Mass., August.

Shoven, John B. 1984. Saving in the U.S. Economy. In *Removing Obstacles to Economic Growth,* ed. Michael L. Wachter and Susan M. Wachter, 187–223. Philadelphia: University of Pennsylvania Press.

Stiglitz, Joseph E. 1972. On the Optimality of the Stock Market Allocation of Investment. *Quarterly Journal of Economics* (February): 25–60.

———. 1979. The Inefficiency of the Stock Market Equilibrium. Princeton University, April. Mimeograph.

Summers, Lawrence H. 1983. Observations on the Indexation of Old Age Pensions. In *Financial Aspects of the U.S. Pension System,* ed. Zvi Bodie and John B. Shoven, 231–51, 257–58. Chicago: University of Chicago Press.

———. 1985. Issues in National Savings Policy. NBER Working Paper no. 1710. Cambridge, Mass., August.

———. 1986. Does the Stock Market Rationally Reflect Fundamental Values? *Journal of Finance* 41, no. 3 (July): 591–601.

Summers, Lawrence H., and Chris Carroll. 1987. Why Is U.S. National Saving So Low? *Brookings Papers on Economic Activity,* no. 2, 607–35.

U.S. Department of Commerce, Bureau of Economic Analysis. 1986. *The National Income and Product Accounts of the United States, 1929–82.* Washington, D.C.: Government Printing Office, September.

———. 1987. *Fixed Reproducible Tangible Wealth in the United States, 1925–85.* Washington, D.C.: Government Printing Office, June.

West, Kenneth. 1988. The Insensitivity of Consumption to News about Income. *Journal of Monetary Economics* 21: 17–33.

Comment

Joseph E. Stiglitz

This paper raises a fundamental issue for those engaged in both theoretical and empirical work in macroeconomics: What should be the appropriate concept of savings and income, and how should it be measured? Bradford challenges the conventional wisdom by putting forward two propositions:

1. "Saving should be defined by reference to the underlying concept of wealth, to which the saving is an increment."
2. "The most useful wealth concept is the market value of assets, not the cost-based measure of capital implied by the use of national income and product account (NIPA) saving."

Bradford's paper makes an important contribution in providing us a cautionary tale on the use of time-series macroeconomic data. Some of us have wondered how much information could be extracted from the standard six or seven time series, which by now have been analyzed exhaustively. If data mining was ever a problem, surely it must be here. This must be a pit that has been exhausted—at the very least the quality of the ore can hardly justify sinking many more resources down what surely must be a bottomless hole.

It has now been widely recognized that macroeconomics must be based on microeconomic foundations. And, if that is so, surely we must base much of our econometric research by focusing on microeconomic units, not the aggregate series that (so many) macroeconometricians have so long taken as their principal province.

Bradford focuses on the difficulties associated with determining saving, the contrasting figures one obtains from looking at national income and product accounts and estimates based on wealth accounts, with saving's being defined as the change in the value of wealth. He argues forcefully that the appropriate measure should be the change in the value of wealth, using current market values.

The magnitude of the discrepancy between the two—even after account of certain obvious differences between the two—makes one pause and ask, Which series should we be using and for what purposes?

Bradford bases his analysis on well-received principles of microeconomics, principles that have long been employed in other branches of economics. In public finance, the Haig-Simon definitions of income reflect the same under-

Joseph E. Stiglitz is a professor of economics at Stanford University, a senior fellow at the Hoover Institution, and a research associate at the National Bureau of Economic Research. He is also the editor of the *Journal of Economic Perspectives*.

lying concerns that give rise to the first proposition. And in finance, the efficient markets hypothesis, holding that the current market value is an unbiased estimated of the future returns, has reigned supreme for more than a decade.

It has also long been recognized that it makes a difference, both to economic theory and econometric practice, what concept of income, saving, and wealth one employs and how these variables are measured. More than two decades ago, Karl Shell, Miguel Sidrauski, and I (1969) analyzed the dynamics of an economy in which savings—measured in a way similar to that suggested by Bradford—was related to income (again, measured in the corresponding way). The dynamics were markedly different from that of the standard growth model.

Still, I am not convinced by Bradford's conclusions. One needs to begin by asking, for what purpose do we want the measure of savings or wealth. Here, I want to distinguish two broad uses. The first is in making predictions. For a variety of reasons, we may want to be able to predict, say, consumption next period. Consumption is related to income, but what concept or measure of income? The second, to which I will turn later in my comments, is for purposes of welfare analysis.

The decades since Keynes have taught us that the concept of income on which consumption is supposed to depend is indeed elusive. Emphasis centered around life-time and permanent income considerations. These neoclassical theories actually argued that one could dispense with income and focus attention on wealth—human plus nonhuman capital. (Of course, general theories, noting the different stochastic properties of human and nonhuman capital, suggested that one could not simply add the two together.)

Recent theoretical and empirical work has cast doubt on this basic conception. Hall has observed, for instance, that if consumption really depended on permanent income, then changes in consumption should be a random walk. Subsequent empirical work seems to have supported the conclusion that consumption is not as volatile as the permanent income theory would suggest.

At the same time, theoretical work has emphasized the importance of capital market imperfections (derived from information asymmetries), providing a rationale for why individuals can smooth their consumption only imperfectly and why shortfalls in current income may be reflected in current consumption (see, e.g., Stiglitz and Weiss 1981, and Greenwald, Stiglitz, and Weiss 1984). These theoretical arguments are bolstered by observations concerning the small reserves of liquid assets held by most households, even in a a wealthy country such as the United States.

These views suggest that a simple measure of wealth such as that envisaged by Bradford has little claim for being *the* measure of wealth to employ in econometric studies.

There are further objections to Bradford's second proposition, that the measure of wealth to be employed should be based on stock market value. From the first perspective, what measure provides a good prediction of, say, con-

sumption, the question is simply an empirical one: the proof is in the pudding. If this measure provides a better "consumption function", then the Bradford consumption function will replace the Friedman and Modigliani-Ando consumption functions in basic macroeconometric models. Bradford has not provided us with the econometric evidence. Here, let me say why I am skeptical.

It would, undoubtedly, be unfair to begin the argument with that dramatic event, the October 1987 stock market crash, but I cannot resist: in that one day, a quarter of the value of America's corporate "wealth," as Bradford would have us measure it, was wiped out. This should have had an instantaneous and large effect on consumption. It was an event which did not go unnoticed. And yet, it did not seem to have such a large effect.

There are strong reasons to believe that individuals do not believe the efficient markets hypotheses. How else can we explain their gambling (investing) behavior? (See Stiglitz 1982.) There is also direct corroborating evidence that they may be well advised not to: the persistent discrepancies in the value of closed-end mutual funds and the value of their underlying securities, and the volatility in that discount, is perhaps the best documented of these pieces of evidence. If individuals do not believe the stock market fully reflects the value of the assets, then the stock market value will not provide the best predictor of their behavior.

There is, by now, a well established, if somewhat controversial, literature on the excess volatility of the stock market. Moreover, volatility varies with the level of prices on the stock market. This evidence too is consistent with individuals not acting simply on the basis of the market value of their assets. (If individuals are risk averse, of course, market value will not be a "sufficient" statistic summarizing all the information that is relevant for their making their consumption decisions.)

Bradford, in his paper, focuses more on saving than on consumption. I am inclined to agree with Bob Hall that it makes more sense to talk about consumption, about the purchases of goods and services, than about savings, which is usually defined negatively as that part of income which is not consumed. Obviously, if we have a good theory of consumption, we can figure out what any particular savings construct will be. And conversely. But focusing on consumption enables us to avoid some of the difficulties associated with defining savings.

Bradford presents one example where his constructs may be of considerable help in understanding what is going on. He argues that savings, as conventionally measured, may be low in the United States not because there has been any change in underlying time preferences. Rather, more of savings has taken the form of an accretion in the value of owner-occupied houses (and real estate more generally). I cannot help but think that there is some truth in that argument, but is seems far from the whole matter. Are (conventionally measured) savings rates in Iowa, Texas, and Oklahoma, which have experienced declines

in house prices and real estate values, markedly higher than in the rest of the country? Have saving rates increased dramatically in the past year, as the rate of increase in real estate prices have declined? I have no doubt that wealth variables (including housing wealth) should enter the consumption function, but I am skeptical whether doing so will explain away all of the current U.S. savings puzzle.

Let me now turn to the second use to which such numbers can be put: welfare analysis, making judgments about the future economic prospects of the economy. Does "savings"—an increase in wealth, as measured in the way that Bradford would have us measure it—provide the best predictor of the increase in the economy's present discounted value of future output? Or does NIPA provide a better measure?

NIPA provides an estimate of the gross investment, but it has long been recognized that the estimates of net investment—that is, the depreciation on existing capital stock—are not reliable. If the economy is growing steadily, with little change in the pace of innovation, then there might be a regular relationship between net and gross investment, and hence the errors committed by focusing on NIPA accounts might not be too serious. But when the economy faces large changes in relative prices, and consequently large changes in the value of various assets, the NIPA accounts might be misleading. The changes in the price of oil might have lead to much capital being economically without value, and focusing on NIPA investment accounts would have, accordingly, led us to overestimate the future productivity of the economy.

The questions is not whether NIPA is a perfect measure. That has never been an issue. The only question is, Would using a market based measure be more reliable? Again, I am skeptical. Besides all the reasons listed above for why one might not believe in the efficient markets hypothesis, there is one more: changes in the market value will also reflect changes in the real rates of interest and in risk discount factors. These present difficult index number problems for any national income accountant. But I am not sure that simply ignoring them—as the Bradford measure would have us do—is appropriate.

The theory of the valuation of national income developed over the past century (see, e.g., Samuelson 1950) is based on a competitive theory with perfect risk markets and, if not perfect information, at least no informational asymmetries. These theories can no longer be taken seriously. There is, accordingly, a fundamental lacuna in the foundations of the theory of the valuation of national income. In the absence of such foundations, we should take a catholic view on how to proceed with both theoretical and empirical work in this area: we should think deeply about what the appropriate variables are and how they can be measured. Bradford has performed a valuable service in focusing our attention on these fundamental questions.

References

Greenwald, B., J. E. Stiglitz, and A. Weiss. Informational Imperfections in the Capital Markets and Macro-economic Fluctuations. *American Economic Review* 74, no. 1 (May): 194–99.

Samuelson, P. A. 1950. Evaluation of Real National Income. *Oxford Economic Papers*. January.

Shell, K., M. Sidrauski, and J. E. Stiglitz. 1969. Capital Gains, Income and Savings. *Review of Economic Studies* 36 (January): 15–26.

Stiglitz, J. E. 1982. Information and Capital Markets. In *Financial Economics: Essays in Honor of Paul Cootner,* ed. William F. Sharpe and Cathryn Cootner, 118–58. Englewood Cliffs, N.J.: Prentice Hall.

Stiglitz, J. E. and A. Weiss. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review* 71, no. 3 (June): 393–410.