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6 Government Saving, Capital Formation, and Wealth in the United States, 1947–85

Michael J. Boskin, Marc S. Robinson, and
Alan M. Huber

6.1 Introduction

In all countries, the public sector owns substantial amounts of capital. Governments also invest as well as consume and make transfer payments. Government capital, like private capital, also depreciates. Most advanced countries attempt to incorporate this information, however imperfectly, in their formal budget documents by generating separate capital and current accounts. The U.S. federal government is the most conspicuous exception.

Government capital formation raises a number of issues important to national economic well-being. For example, net capital formation may be a major component of net national saving or dissaving. It may be more appropriate to finance government capital formation than government consumption by borrowing rather than taxing. Some types of government capital formation are complementary to private activity and enhance productivity, but government investments do not have to meet the same kind of market test as private investment does.[1] We do

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The authors are indebted to the Center for Economic Policy Research at Stanford University for support of this research. They are deeply indebted to John Musgrave for generously providing unpublished data and to Paul Pieper for providing data on inventories and par-to-market indices for financial assets and liabilities. This paper was originally presented at the NBER Conference on Research in Income and Wealth, held in Baltimore, Md., 27–28 March 1987. The authors have greatly benefited from the comments of the conference participants, especially Robert Lipsey and Helen Stone Tice, and the numerous valuable suggestions made by their discussant, Robert Eisner.

not have an analogue to the stock market to value it. Thus, measures of government capital and investment may provide particularly useful information that cannot be inferred from other data.

Measuring government capital raises difficult conceptual issues (see, e.g., Eisner and Nebhut 1982). Among these are the questions of what government versus private product is and what capital is.[2] Another set of questions concerns whether to include and how to measure government human capital investment.[3]

Still, separating out capital and current expenditures and generating sensible measures of depreciation and net investment can be important inputs into various kinds of economic analyses. It would enable us to provide a more accurate picture of how government is using the funds that it raises. It could help develop better measures of productivity and capital. It can improve our understanding of fiscal history and highlight emerging fiscal issues, such as the alleged deterioration of the infrastructure. It may be useful in explaining private consumption and saving (Boskin 1988). Most important from the standpoint of this paper, it is a necessary input into comprehensive measures of net national saving and national wealth and into government balance sheets.

One purpose of this paper is to provide estimates of various types of government investment, depreciation, and capital. Our major innovations lie in the estimates of depreciation of fixed reproducible capital, the value of government land, and the value of government mineral rights.

We then use these series, and corresponding ones for the private sector, to obtain values for government consumption and net worth and to adjust gross national product (GNP), net national product (NNP), and national saving and investment figures from the national income and product accounts (NIPAs). Thus, we seek to complement previous studies attempting to extend measures of national income and product to a more comprehensive treatment of the government sector (e.g., Eisner and Nebhut 1982; Goldsmith 1962, 1982; Martin, Landefeld, and Peskin 1982; Kendrick 1976; Eisner and Pieper 1984; and Eisner 1986).

We focus on a particular subset of improvements to the NIPAs and previous studies while ignoring others. For example, we do not examine mandated private activity or uncompensated or undercompensated services; nor do we examine human capital expenditures. This is not because we consider these issues unimportant but because such a focus allows us to concentrate on other issues. Even with this deliberately narrow focus, our estimates of GNP and NNP extended to include the return to government capital substantially exceed the traditional numbers. Our estimates of the combined state-local and federal government capital stock are a large fraction of the analogously computed private capital stock. Government net saving, defined as revenues less con-

sumption rather than by the traditional budget surplus or deficit figures (in accord with the Organization for Economic Cooperation and Development [OECD] and U.N. system of national accounts for other countries), and government net capital formation are substantial. They also vary over time and can be important components of net national saving and net national investment.

The paper is organized as follows. The next section discusses fixed reproducible capital—the methodology, concerns with the traditional estimates of the Bureau of Economic Analysis (BEA), and various estimates and trends of fixed reproducible capital of the federal and state-local governments in the United States. It provides important estimates based on depreciation assumptions that are consistent with empirical estimates for the private sector. The depreciation estimates generate internally consistent capital stock and imputed rent series. It also presents consistent real net revaluation estimates.

Section 6.3 discusses government inventories, presents data on inventory values, including military and nonmilitary as well as a breakdown by level of government, and compares inventory investment with fixed reproducible investment. It also discusses real revaluations for inventories.

In Section 6.4, we provide comparisons of these estimates of government investment and capital stocks to estimates of net investment and capital stocks in the private sector. We update through 1985 and expand the estimates of Hulten and Wykoff (1981) to consumer durables and residential capital. We also compare government and private capital stocks using consistent depreciation assumptions, although they may be controversial ones.

Section 6.5 presents revised saving, investment, and consumption as well as adjusted GNP and NNP estimates. In addition to imputing the rental flow from government capital as current consumption and developing improved estimates of depreciation to estimate net investment and the accrued capital stock, we also make corresponding adjustments for consumer durables purchases. These are substantial in the United States, substantially exceed the depreciation of the durables, and hence contribute an important component to national capital formation (for an elaboration of the important role such adjustments can play in international comparisons—e.g., with Japan—see Boskin and Roberts 1986). The data reveal interesting patterns of government consumption, saving, and net investment. The federal and, even more important, state and local government sectors are major contributors to national capital formation, and their patterns of capital formation have differed substantially over time and relative to the private sector.

Financial assets and conventional liabilities are discussed in section 6.6. It presents the real market values of federal and state-local financial assets and liabilities. It updates and makes minor changes to the work

of Eisner and Pieper (1984) and Eisner (1986), which draw on the work of Seater (1981) and Cox and Hirschhorn (1983). In addition to the tangible assets, government units also have substantial financial assets as well as the traditional liabilities, which have drawn so much recent attention.

Section 6.7 updates and corrects estimates of the value of federal mineral rights developed by Boskin et al. (1985) and extends the analysis—albeit on the basis of scanty data—to state and local mineral rights. The value of these rights is quite large and fluctuates substantially, as one might suppose, given the substantial fluctuation in the prices of minerals. In some years, the change in the value of mineral rights exceeds the conventionally measured budget deficit.

Section 6.8 discusses the value of federal and state-local ownership of land. Again, this extends the analysis in Boskin et al. (1985) to the last several years and to the state and local sector. Various methodological issues are discussed. Governments own a substantial fraction of the total acreage of land in the United States and a modest fraction of the total value of land.

Section 6.9 is concerned with contingent liabilities such as loan guarantees, deposit insurance, and government pension liabilities. We do not provide systematic time series on the value of these contingent liabilities but discuss the conceptual issues in valuing them and some data on the outstanding value of loans, guarantees, and insured deposits. The economic consequences of subsidized loans or loan guarantees depend heavily on one's view of credit markets, especially the supply of funds to them (see Gale 1987). Various issues are discussed in defining a sensible estimate of the expected present value of the contingent liabilities flowing from new commitments of subsidized loans and guarantees and deposit insurance.

Section 6.10 discusses the most important set of potential government liabilities, the unfunded liabilities in social security and government pension plans. We refer the reader to other sources for time series on these data, but we discuss a variety of issues surrounding these unfunded liabilities and their sensitivity to various economic and demographic assumptions as well as to political decisions, and we highlight some key recent events in the system.

In section 6.11, we present a preliminary attempt to develop a balance sheet for the government sector of the U.S. economy. After discussing the advantages and numerous limitations of our estimates and government net worth calculations in general, we present balance sheets for federal and state-local governments for selected years. The trends, particularly in federal "net worth," are sometimes dramatic. Looking at tangible and financial assets and conventional liabilities, the federal government had a net worth (in 1985 dollars) of over $1.0 trillion in 1980, substantially higher than in 1970, but had lost two-thirds of it by 1985.

A brief conclusion summarizes the results and emphasizes the large number of caveats we have had to invoke along the way. It also suggests various avenues for future research.

6.2 Fixed Reproducible Capital

Goldsmith (1962) and Kendrick (1976) both estimated the government capital stock as part of their pioneering studies of national wealth. The most recent and comprehensive estimates of fixed reproducible government capital stocks have been made by the BEA.[4] All three studies use the perpetual inventory method to calculate net capital stocks: gross investment is cumulated, and estimated accumulated depreciation is subtracted. Our estimates use the BEA's gross investment series and most of their service life assumptions, but we adopt a different depreciation method.

The BEA assumes straight-line depreciation over the estimated economic service life of each asset.[5] However, within each category of structure or equipment, the BEA allows for a distribution in service lives around the mean, reflecting a retirement distribution.[6] Since the assets with the shortest assumed lives are retired first, the depreciation rate for any category of investment slows down once retirements start to occur. The resulting overall depreciation pattern resembles a geometric decay.

The straight-line assumption made by the BEA is basically arbitrary. A more satisfactory approach to estimating economic depreciation makes use of the observed sales prices of used assets. For the private sector, Hulten and Wykoff (1981) collected data on used asset price from several sources, weighted these price by estimated survival probabilities to account for discarded assets, and estimated the form and rate of economic depreciation. They used a functional form that included all the common assumptions—geometric, linear, or one-hoss-shay—as special cases. Although none of the common forms was accepted statistically, the estimated price-age profiles were found to be close to geometric for the classes of assets considered.[7] They then estimated the constant depreciation rate that provided the best fit.

These results were used to derive depreciation rates for the types of producers' durables and nonresidential structures defined in the NIPAs. There were sufficient data to estimate some types directly. The declining-balance rates, R, found for these categories were used to infer depreciation rates, δ, for the remainder from the definition $\delta = R/T$, where T equals the BEA estimated service life. The average R value for four equipment categories was 1.65, so depreciation rates for other equipment classes were calculated as $\delta = 1.65 / T$. The average R value for two types of structures was 0.91, so depreciation rates assigned to other types of structures were $\delta = 0.91 / T$.

The Hulten-Wykoff depreciation rates are consistent with the observations of Young and Musgrave (1980) and Hulten and Wykoff (1981) summarizing earlier studies: equipment depreciates faster than straight line in the early years, while structures depreciate more slowly. These depreciation rates are certainly significant topics for future research, but we feel that the Hulten-Wykoff depreciation estimates are the best available.[8]

In addition to fitting the used-asset-price data more closely, the geometric depreciation assumption has important theoretical advantages.[9] The depreciation methods and measures used in the NIPAs, the BEA capital stock series, the important work of Denison (1957, 1962, 1967, 1972, 1974, 1979, 1985), Kendrick (1973), and studies using the NIPA and/or BEA capital stock data are internally inconsistent. The measures of capital must employ the same pattern of relative differences of capital goods of different vintages for both capital stocks and rental prices. As pointed out originally by Jorgenson and Griliches (1972), the depreciation patterns assumed in these studies cannot be used both to impute the rental prices and to measure the capital stocks against which the rental prices are applied to measure imputed rent, gross or net.[10] The principle disadvantage of geometric depreciation is that retirement never occurs. Of course, all simple depreciation formulae assume that depreciation is constant over time and across assets within a category.

Given the empirical evidence and theoretical advantages, we assume that fixed government capital depreciates geometrically. Lacking evidence on prices for used government assets,[11] we use the market evidence on used private assets gathered by Hulten and Wykoff; that is, the depreciation rate for government equipment is 1.65/(service life) and that for each type of structure is 0.91/(service life). With one exception, the BEA-estimated service lives for the various types of government capital are used to infer depreciation rates.[12]

Our estimates of the net investment and net stock of government fixed reproducible capital in 1985 dollars are shown in table 6.1. We give our separate estimates for federal and state-local governments in table 6.2. Both tables give the corresponding estimates for the BEA, updated by us to 1985 dollars.[13]

We estimate that the net government fixed reproducible capital stock exceeds $2.7 trillion dollars, having more than doubled in real terms since World War II. As can be seen in figure 6.1, the broad trends of our estimates are consistent with those of the BEA, which is not surprising since we use their gross investment data and most of their service lives. Nevertheless, there are important differences between the two series regarding both the level and the postwar growth of the government capital stock. Our 1985 estimate is 19 percent higher than that of the BEA, while at the end of World War II our value was 8

Table 6.1 **Total Government Fixed Reproducible Capital (billions of 1985 dollars)**

	Net Stock		Net Investment	
Year	BEA	BRH	BEA	BRH
1927	343.4	369.4	13.8	15.3
1928	358.5	386.1	14.7	16.3
1929	373.7	403.1	14.9	16.6
1930	393.6	424.8	19.4	21.3
1931	414.4	447.5	20.3	22.2
1932	429.9	465.2	15.2	17.3
1933	438.1	475.6	8.0	10.3
1934	451.4	491.3	13.1	15.4
1935	465.1	507.4	13.6	16.0
1936	490.0	534.8	24.5	27.0
1937	508.4	555.9	18.1	20.8
1938	531.4	581.6	22.5	25.2
1939	559.9	612.8	28.0	30.7
1940	583.7	639.3	23.5	26.1
1941	657.4	702.5	72.9	62.6
1942	859.6	854.7	199.8	150.8
1943	1,114.1	1,028.4	250.2	171.1
1944	1,292.1	1,189.2	174.5	157.6
1945	1,341.3	1,241.2	48.0	50.8
1946	1,154.3	1,121.8	−183.5	−117.1
1947	1,021.7	1,047.6	−129.7	−72.8
1948	935.1	1,004.3	−84.6	−42.5
1949	896.0	988.2	−38.3	−15.8
1950	886.1	986.4	−9.7	−1.7
1951	904.3	1,008.6	17.9	22.0
1952	956.9	1,062.5	51.9	53.1
1953	1,007.8	1,114.6	50.1	51.3
1954	1,053.2	1,162.5	43.8	47.0
1955	1,088.0	1,203.1	35.1	40.0
1956	1,119.3	1,241.5	30.7	37.7
1957	1,146.7	1,277.4	27.0	35.2
1958	1,180.4	1,319.9	33.0	41.8
1959	1,218.9	1,367.6	37.9	46.8
1960	1,259.9	1,417.6	40.3	49.2
1961	1,309.5	1,475.8	48.9	57.2
1962	1,358.4	1,533.1	48.1	56.2
1963	1,412.9	1,595.6	53.6	61.4
1964	1,467.8	1,658.7	54.1	61.9
1965	1,523.7	1,723.2	54.9	63.3
1966	1,584.8	1,793.2	60.3	68.7
1967	1,644.3	1,862.3	58.8	67.9
1968	1,704.8	1,932.9	59.7	69.3
1969	1,756.8	1,995.6	51.2	61.6
1970	1,799.6	2,049.6	43.3	53.0

(*continued*)

Table 6.1 (continued)

Year	Net Stock		Net Investment	
	BEA	BRH	BEA	BRH
1971	1,841.1	2,102.8	39.8	52.2
1972	1,883.1	2,156.1	41.5	52.3
1973	1,918.0	2,202.5	34.4	45.6
1974	1,950.6	2,246.8	32.1	43.6
1975	1,981.7	2,289.8	30.5	42.2
1976	2,009.0	2,329.3	26.7	38.7
1977	2,030.0	2,362.8	20.6	33.0
1978	2,063.2	2,408.3	32.5	44.7
1979	2,092.4	2,449.6	28.6	40.5
1980	2,121.5	2,490.9	28.5	40.6
1981	2,144.3	2,525.8	22.3	34.3
1982	2,175.0	2,567.6	30.0	41.0
1983	2,202.2	2,605.8	26.6	37.5
1984	2,236.9	2,650.8	33.9	44.1
1985	2,285.5	2,708.7	47.4	56.8

Sources: Fixed reproducible capital includes equipment and nonresidential and residential structures. The BEA series are constant-cost estimates in 1982 dollars updated to 1985 dollars by our use of price series implicit in the BEA current- and constant-cost estimates of net capital stocks and depreciation flows for each asset category. The same procedure was used to convert our estimates (the series labeled "BRH") from 1982 dollars into 1985 dollars. Our estimates employ the perpetual inventory method and use BEA gross investment data. Given the evidence of Hulten and Wykoff (1981) on the depreciation of private assets, we assume geometric depreciation of government capital with a declining-balance rate for equipment of 1.65/(service life) and for structures of 0.91/(service life). We use BEA estimated service lives, including detailed lives available for some types of capital based on observed usage, to infer depreciation rates, except that we assume a shorter forty-year service life for highways and streets. The 1986 BEA wealth data tape, unpublished BEA data kindly provide by John Musgrave, and several *Survey of Current Business* articles are our principal data sources. For further details on our methods, see text.

percent lower.[14] The BEA's estimate of the postwar growth in net government capital is more than 40 percent below ours.

With the exception of World War II, state and local government capital stocks have been larger than those of the federal government, as shown in figure 6.2. Currently, state and local governments own 69 percent of total government fixed reproducible capital. Except during military buildups, state and local governments provide an even larger fraction of total government investment, as can be seen in figure 6.3. The surges in federal investment roughly coincide with World War II, the Korean and Vietnam wars, and the Reagan defense buildup.

The behavior of the various components of federal and state-local investment and capital sheds light on several policy debates, though we can only touch on them in this paper. Figure 6.4 pictures the division

Table 6.2 **Federal and State-Local Fixed Reproducible Capital (billions of 1985 dollars)**

	Federal				State-Local			
	Net Stock		Net Investment		Net Stock		Net Investment	
Year	BEA	BRH	BEA	BRH	BEA	BRH	BEA	BRH
1927	75.1	80.1	−1.9	−1.3	268.3	289.3	15.7	16.5
1928	73.4	79.1	−1.7	−1.0	285.1	307.0	16.4	17.3
1929	72.3	78.8	−1.1	−.3	301.4	324.3	16.0	17.0
1930	72.1	79.3	−.2	.6	321.6	345.5	19.7	20.7
1931	73.0	81.1	.9	1.7	341.4	366.4	19.4	20.5
1932	75.3	84.2	2.3	3.1	354.7	381.0	12.9	14.2
1933	79.2	88.9	3.9	4.7	358.9	386.7	4.1	5.6
1934	85.0	95.5	5.8	6.5	366.4	395.8	7.3	8.9
1935	92.8	103.9	7.7	8.4	372.4	403.5	5.8	7.6
1936	99.4	111.4	6.6	7.4	390.6	423.4	17.8	19.5
1937	105.2	118.0	5.7	6.6	403.3	438.0	12.4	14.2
1938	111.1	124.7	5.9	6.7	420.3	456.9	16.6	18.5
1939	118.0	132.3	6.9	7.6	441.9	480.5	21.1	23.1
1940	128.2	143.0	10.2	10.6	455.5	496.4	13.3	15.5
1941	195.7	197.5	66.8	54.1	461.7	505.0	6.1	8.5
1942	400.1	349.2	201.9	150.4	459.6	505.5	−2.1	.5
1943	662.5	528.1	258.0	176.1	451.6	500.3	−7.8	−5.1
1944	849.3	694.9	183.1	163.4	442.7	494.4	−8.7	−5.8
1945	906.5	751.8	55.8	55.7	434.7	489.4	−7.9	−4.9
1946	721.2	630.9	−181.9	−118.5	433.1	490.9	−1.5	1.4
1947	581.2	546.4	−137.4	−82.9	440.4	501.2	7.7	10.1
1948	484.2	489.6	−95.4	−55.7	450.9	514.7	10.8	13.2
1949	431.2	456.5	−52.1	−32.4	464.9	531.7	13.8	16.6
1950	404.2	434.7	−26.4	−21.3	481.9	551.6	16.7	19.6
1951	404.9	436.3	.6	1.7	499.4	572.3	17.3	20.3
1952	439.6	469.3	34.3	32.6	517.3	593.3	17.6	20.6
1953	470.5	498.3	30.5	28.7	537.2	616.4	19.6	22.7
1954	488.5	515.5	17.7	17.1	564.7	646.9	26.1	29.9
1955	494.8	524.5	6.3	8.9	593.2	678.6	28.7	31.0
1956	496.5	530.1	1.7	5.6	622.8	711.4	29.0	32.2
1957	492.2	530.9	−4.1	.9	654.5	746.5	31.1	34.3
1958	491.7	535.6	−.5	4.8	688.7	784.3	33.5	37.0
1959	495.4	544.7	3.7	9.0	723.5	822.9	34.1	37.7
1960	501.8	556.3	6.4	11.5	758.1	861.4	33.9	37.7
1961	513.4	572.3	11.4	15.9	796.2	903.5	37.5	41.3
1962	523.2	586.3	9.7	13.9	835.2	946.8	38.3	42.3
1963	534.6	601.5	11.2	15.1	878.3	994.2	42.4	46.4
1964	543.3	614.0	8.6	12.4	924.5	1,044.7	45.5	49.5
1965	549.9	624.6	6.5	10.6	973.9	1,098.6	48.4	52.7
1966	557.4	636.4	7.4	11.8	1,027.5	1,156.7	52.9	57.0
1967	558.2	642.3	.8	5.9	1,086.2	1,220.0	58.0	62.0
1968	557.4	647.0	−.8	4.7	1,147.4	1,285.8	60.5	64.6
1969	554.4	649.9	−2.9	2.8	1,202.4	1,345.7	54.2	58.7
1970	550.2	651.7	−4.2	1.8	1,249.4	1,397.8	47.5	51.2
1971	546.4	654.2	−3.7	2.5	1,294.7	1,448.5	43.5	49.7
1972	548.6	662.1	2.1	7.8	1,334.5	1,493.9	39.4	44.5
1973	547.7	666.6	−.9	4.5	1,370.3	1,535.8	35.3	41.1
1974	544.1	668.2	−3.6	1.6	1,406.6	1,578.6	35.7	42.0

(*continued*)

Table 6.2 (continued)

	Federal				State-Local			
	Net Stock		Net Investment		Net Stock		Net Investment	
Year	BEA	BRH	BEA	BRH	BEA	BRH	BEA	BRH
1975	544.8	673.8	.7	5.6	1,436.9	1,616.0	29.9	36.7
1976	547.3	681.0	2.5	7.1	1,461.7	1,648.2	24.2	31.6
1977	551.0	689.1	3.6	8.1	1,479.0	1,673.7	17.0	24.9
1978	563.2	705.1	12.0	15.8	1,500.0	1,703.2	20.5	28.9
1979	574.8	719.8	11.3	14.4	1,517.7	1,729.8	17.3	26.1
1980	586.3	734.2	11.3	14.2	1,535.2	1,756.7	17.2	26.4
1981	598.3	748.5	11.7	14.1	1,546.0	1,777.2	10.6	20.1
1982	621.6	772.9	22.8	23.9	1,553.4	1,794.7	7.2	17.1
1983	641.9	793.9	19.9	20.6	1,560.3	1,811.9	6.8	16.9
1984	665.9	817.8	23.5	23.5	1,571.0	1,833.0	10.4	20.6
1985	698.7	849.4	31.3	31.1	1,586.8	1,859.3	16.1	25.7

Sources: See source note to table 6.1 and text.

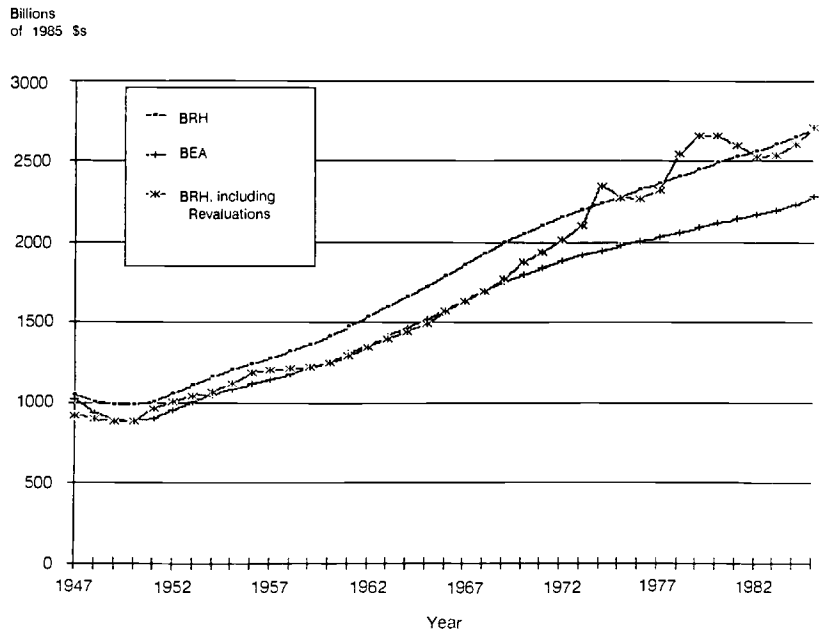

Fig. 6.1 Our (BRH) and BEA estimates of total government fixed reproducible net capital and BRH net estimates, including real net revaluations

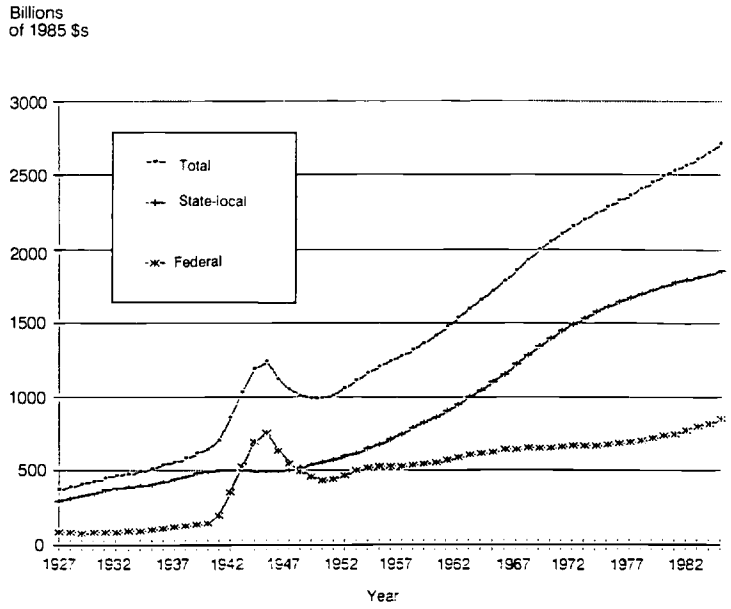

Fig. 6.2 New estimates of government fixed reproducible net capital stocks

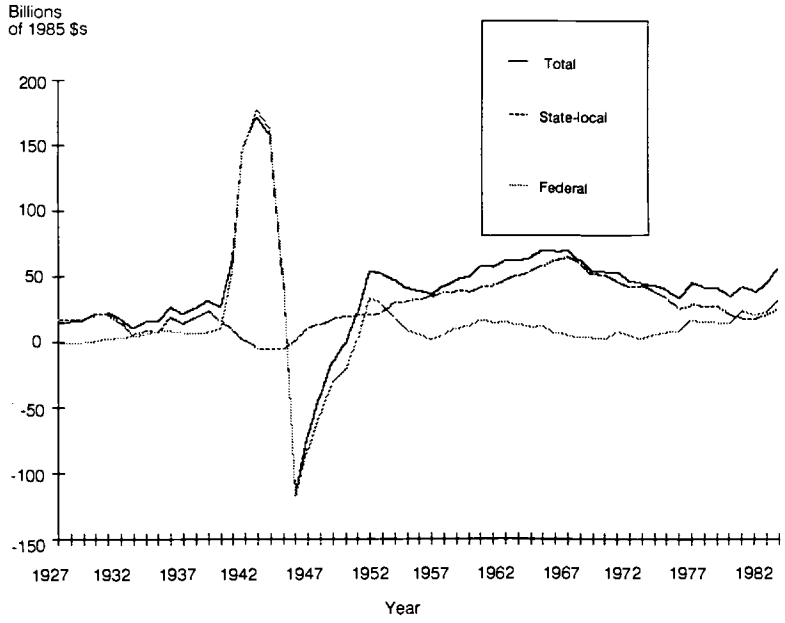

Fig. 6.3 Our (BRH) estimates of government net investment in fixed reproducible capital

Fig. 6.4 Our (BRH) estimates of federal net investment in fixed reproducible capital

of aggregate federal net investment between military and nonmilitary. For a twenty-five year period beginning in 1954, the military and nonmilitary series track fairly closely, with nonmilitary investment usually slightly larger. Starting in 1979, however, the two series diverge, as military net investment has reached record postwar levels and civilian investment has dropped.

In figure 6.5, we divide net state and local investment into three major categories: educational buildings, highways, and other. The "other" category is primarily other types of structures; equipment is less than 5 percent of the net state and local stock. The three components have a similar pattern: after disinvestment during World War II, all three reach peaks in the late 1960s and drop to troughs in the recent recession. The observed pattern of aggregate net investment, therefore, cannot be attributed solely to the baby boom or the construction of the interstate highway system. The substantial levels of net investment in the highway and other categories, even in recessions, casts doubt on reports of a deteriorating infrastructure.[15]

6.2.1 Real Revaluations of Tangible Fixed Reproducible Capital

The data discussed above and presented in tables 6.1 and 6.2 do not include net revaluations for tangible reproducible capital due to changes

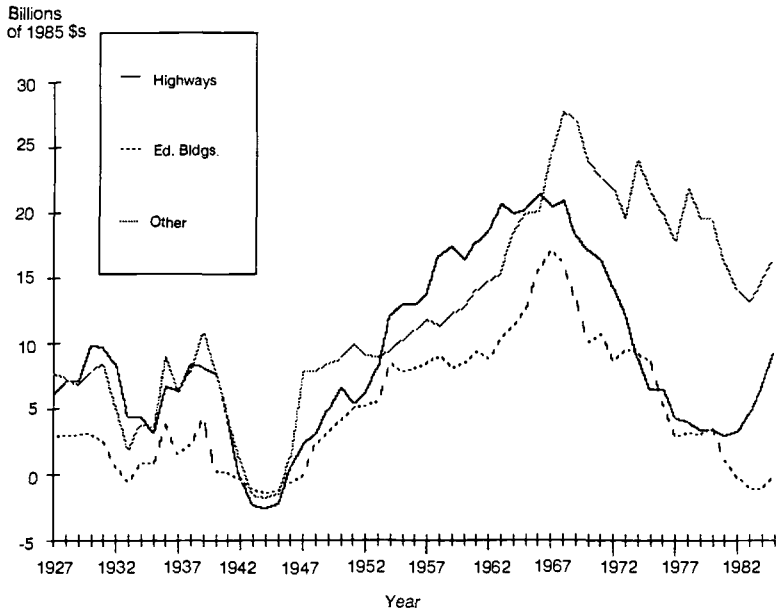

Fig. 6.5 Our (BRH) estimates of state and local net investment in fixed reproducible capital

in capital goods prices relative to the general price level. They deflate current-dollar figures by the BEA implicit deflators for each type of capital. Because real revaluations can be substantial (see Eisner 1980), we present data on real revaluations (in constant 1985 dollars) of federal and state-local tangible fixed reproducible capital in table 6.3. Real net revaluations are defined as the change in the value of capital minus real net investment and minus the change in the value of capital that would just compensate for changes in the general price level. Thus, real net investment (calculated from the specific implicit price deflators for investment goods) plus real net revaluations plus the real capital stock in period $t - 1$ equals the real capital stock in period t (where the real capital stocks are just the current-cost series as deflated by the respective end-of-year GNP deflator).[16]

As table 6.3 reveals, both the federal and the state-local sectors have experienced substantial real capital gains and losses on their corresponding fixed capital stocks. The net revaluations were generally negative in the 1950s and 1960s, positive in the 1970s, and negative in the 1980s. While real revaluations are substantial in absolute dollars and relative to net investment, they are modest relative to the capital stock. For example, the $170 billion and $32 billion real revaluations of state-local and federal capital stocks for 1974 amount to about 10 and 5

Table 6.3 **Real Net Revaluations of Government Fixed Reproducible Capital (billions of 1985 dollars)**

Year	State-Local	Federal	Total
1948	6.7	21.2	27.9
1949	−10.3	8.2	−2.1
1950	−3.0	2.0	−1.0
1951	33.9	22.8	56.7
1952	7.2	.5	−6.7
1953	−22.7	6.5	−16.2
1954	−16.4	−8.1	−24.5
1955	6.8	8.3	15.1
1956	13.0	14.7	27.7
1957	−9.2	−2.4	−11.6
1958	−22.0	−11.1	−33.0
1959	−30.3	−13.5	−43.8
1960	−13.5	−4.2	−17.7
1961	−13.3	−2.5	−15.8
1962	−4.6	−3.6	−8.3
1963	−3.6	−.1	−3.7
1964	−15.6	−3.0	−18.6
1965	−4.6	−3.7	−8.3
1966	4.3	−1.9	2.4
1967	−5.5	1.5	−4.0
1968	−4.2	−2.0	−6.2
1969	12.5	1.7	14.3
1970	39.8	9.7	49.4
1971	12.2	.2	12.4
1972	17.6	7.1	24.6
1973	33.9	4.7	38.7
1974	169.6	31.8	201.4
1975	−88.8	−17.0	−105.8
1976	−59.3	4.1	−55.3
1977	22.9	−2.6	20.3
1978	167.2	13.8	181.0
1979	53.6	18.8	72.4
1980	−40.6	7.5	−33.1
1981	−96.3	−6.3	−102.6
1982	−96.1	−13.6	−109.7
1983	−16.7	−5.4	−22.1
1984	27.6	−3.6	24.0
1985	47.8	−6.6	41.2

percent of the corresponding stocks but were much larger than net investment. These large real capital gains were offset the following year by real losses approximately half as large. Indeed, cumulating the combined state-local and federal net revaluations from 1948 to 1985 yields a total of about $160 billion, or 6 percent of the estimated 1985 real net stock, excluding revaluations. Thus, while the year-to-year

fluctuations are important, the overall cumulative real wealth effect of revaluations has been quite modest, as is evident from figure 6.1. In principle, one would add real net revaluations to real net investment to obtain total net capital formation for each year. Since we often wish to compare gross or net investment spending with borrowing, we adopt the procedure here of separate presentations of real revaluations but do include the values adjusted for revaluations in the balance sheets in section 6.11.

6.3 Government Inventories

The focus of the previous section was on government equipment and structures, but inventories are an important part of government reproducible capital, at least at the federal level. Table 6.4 presents estimates of inventory stocks and investment for both the federal government and the government sector. These are unpublished BEA series updated by us to 1985 dollars.[17]

Table 6.4 **Federal and Total Government Inventory Stocks and Investment (billions of 1985 dollars)**

Year	Federal Stock	Federal Investment	Total Stock	Total Investment	Total Real Revaluations
1926	3.0	.0	3.2	.0	. . .
1927	3.1	.1	3.3	.1	. . .
1928	3.1	.1	3.4	.1	. . .
1929	3.2	.1	3.4	.0	. . .
1930	3.3	.1	3.6	.1	. . .
1931	3.4	.1	3.7	.2	. . .
1932	3.5	.1	3.9	.1	. . .
1933	3.6	.1	4.0	.1	. . .
1934	4.7	1.1	5.1	1.2	. . .
1935	4.8	.2	5.3	.1	. . .
1936	4.2	−.7	4.6	−.7	. . .
1937	4.7	.5	5.1	.5	. . .
1938	7.0	2.3	7.4	2.3	. . .
1939	9.4	2.4	9.8	2.5	. . .
1940	13.7	4.3	14.2	4.3	. . .
1941	28.5	14.8	28.9	14.8	. . .
1942	62.2	33.7	62.6	33.7	. . .
1943	113.9	51.7	114.3	51.7	. . .
1944	173.8	59.9	174.2	59.9	. . .
1945	208.4	34.6	208.8	34.6	. . .
1946	173.5	−34.9	173.9	−35.0	. . .
1947	139.4	−34.1	139.8	−34.1	. . .

(continued)

Table 6.4 (continued)

Year	Federal Stock	Federal Investment	Total Stock	Total Investment	Total Real Revaluations
1948	107.5	−31.9	107.9	−31.9	−21.1
1949	91.2	−16.3	91.7	−16.2	−4.5
1950	80.6	−10.6	81.1	−10.6	−9.3
1951	88.2	7.6	88.6	7.6	−3.5
1952	112.4	24.2	112.9	24.2	−6.0
1953	145.8	33.3	146.2	33.3	16.7
1954	162.2	16.5	162.7	16.5	30.2
1955	161.2	−1.0	161.8	−.9	10.1
1956	160.1	−1.2	160.6	−1.2	−7.9
1957	159.1	−.9	159.6	−.9	−11.8
1958	160.2	1.1	160.8	1.2	−4.9
1959	155.5	−4.7	156.3	−4.5	−4.6
1960	150.8	−4.7	151.6	−4.7	−4.9
1961	144.5	−6.3	145.3	−6.3	−4.0
1962	146.5	2.0	147.3	2.0	−6.8
1963	150.7	4.2	151.6	4.3	−3.0
1964	147.2	−3.5	148.2	−3.4	−1.2
1965	139.0	−8.2	140.1	−8.1	−3.3
1966	135.3	−3.6	136.5	−3.5	−8.0
1967	141.9	6.5	143.2	6.6	−4.2
1968	144.6	2.8	146.1	2.9	−4.9
1969	158.8	14.2	160.4	14.4	−5.5
1970	152.5	−6.3	154.4	−6.1	−5.4
1971	147.2	−5.4	149.2	−5.2	−4.7
1972	135.8	−11.4	137.9	−11.3	.2
1973	127.6	−8.2	129.8	−8.1	1.3
1974	132.1	4.5	134.4	4.6	5.7
1975	128.8	−3.3	131.3	−3.0	1.2
1976	127.9	−.9	130.6	−.7	3.1
1977	131.5	3.6	134.5	3.9	3.3
1978	137.1	5.6	140.2	5.7	.8
1979	132.7	−4.5	135.6	−4.6	18.7
1980	132.3	−.4	135.2	−.4	6.6
1981	138.0	5.7	140.8	5.6	−2.6
1982	156.6	18.6	159.5	18.7	−1.5
1983	169.2	12.6	172.7	13.1	−16.9
1984	182.5	13.3	186.1	13.5	−9.1
1985	215.5	33.0	219.4	33.3	−8.1

Source: Unpublished BEA 1982 constant dollar estimates of end-of-year stocks of federal government military, federal government nonmilitary, and state and local government inventories were each updated to 1985 constant dollars by multiplying by the ratio of the 1985 BEA current dollar stock to the 1985 constant (1982) dollar stock for each type. Revaluations are calculated as described in text.

Government inventories are substantial, exceeding $200 billion in 1985, finally surpassing the World War II peak. Almost all the inventories are held by the federal government; for most years, state and local governments had less than 1 percent of the total. Figure 6.6 illustrates that most of these federal inventories are military, such as munitions. Not surprisingly, military inventories are quite volatile.

Nonmilitary inventories have grown, however, from 5 percent of the stock in 1945 to almost 40 percent in 1985. A further breakdown of nonmilitary inventories reveals that, in 1982, more than half were strategic stockpiles of minerals, nuclear materials, helium, and oil (the Strategic Petroleum Reserve).[18] More than two-thirds of the remaining nonmilitary inventories were surplus crops.

Real inventory stocks declined steadily from 1954 through 1980. Since then, inventory investment has taken off, reaching $33 billion in 1985. Inventory changes have a large effect on the level of net federal investment in reproducible capital, as shown in figure 6.7. Net federal investment in structures and equipment has been positive every year since 1950, according to our estimates. When inventories are added in, however, net federal investment becomes negative in five of the last thirty-five years. When inventories increase, as they did in the 1980s,

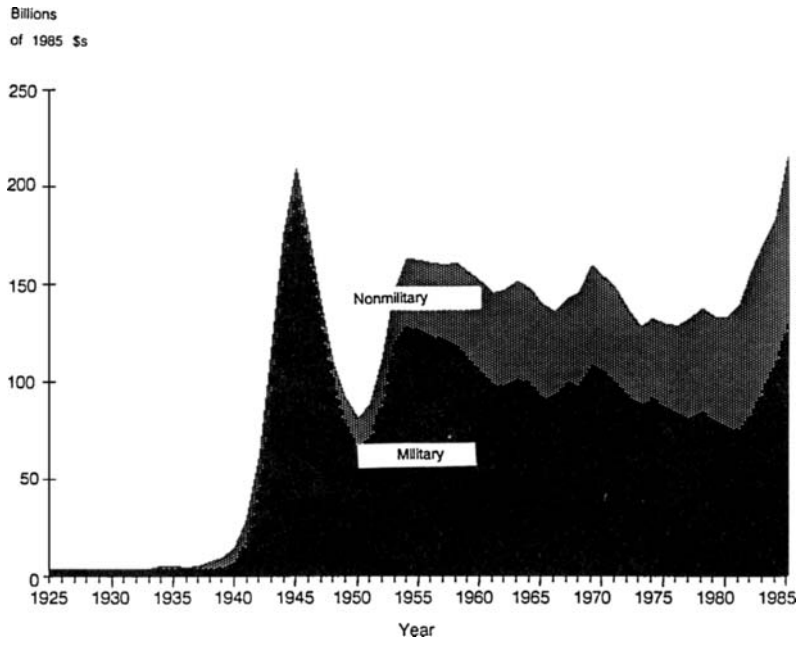

Fig. 6.6 Federal inventory stocks

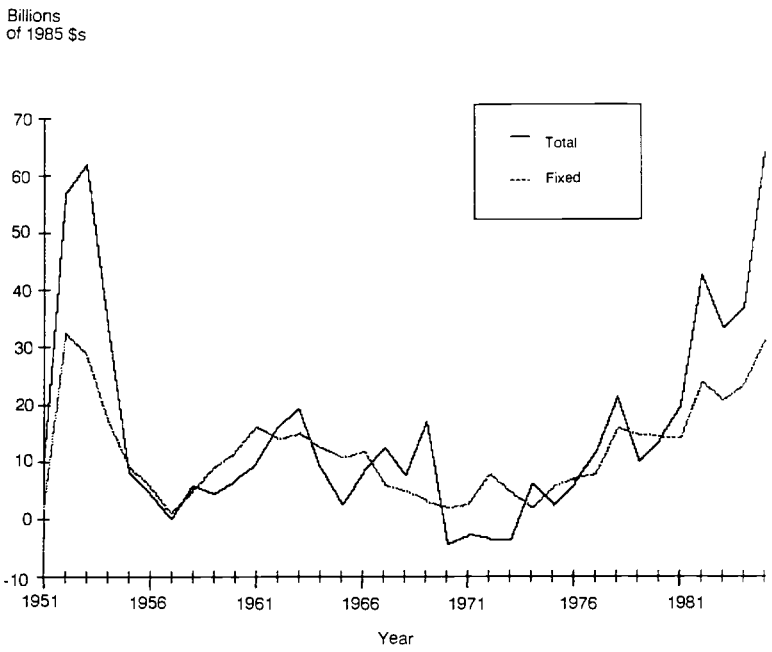

Fig. 6.7 Federal government net investment in reproducible capital: Total and excluding inventories (fixed)

the effect is also large: more than half our estimated $64 billion in net federal investment in 1985 is inventory investment.

6.3.1 Real Inventory Revaluations

As with fixed reproducible capital, real net revaluations may occur for government inventories. Table 6.4 includes a column on estimated real inventory revaluations defined analogously to that for the fixed reproducible capital stock. These data reveal that capital losses on inventories occurred in every year except 1953–55 and 1972–80. Cumulatively, the total real capital loss was approximately $70 billion, about one-third of the value of the net stock excluding revaluations.

6.4 Comparisons with Private Capital

One of the purposes of this paper is to present more comprehensive measures of national product and investment. While we concentrate on government capital, consistency requires adjustments to private capital measures as well. These adjustments also allow a more accurate comparison between private capital and investment and our estimates for the government sector.

Our measures differ from the NIPAs in the treatment of consumer durables and in our depreciation assumptions. As many have noted,[19] expenditures on consumer durables should be treated as investment, while an imputed service flow from these assets should be added to consumption. Accordingly, we add expenditures on consumer durables to gross private domestic investment.

In order to determine private capital stock and net investment, depreciation assumptions must be made. For the various classes of structures and equipment, we generally use the constant depreciation rates that were estimated and imputed by Hulten and Wykoff (1981).[20] For those categories whose service lives, as estimated by the BEA, changed, we imputed depreciation rates using the formulas described in section 6.2. For residential structures, we assumed a depreciation rate of 0.91/(service life) for the various components, as with most other categories of structures. For consumer durables other than vehicles, we followed Christensen and Jorgenson (1973) in assuming double-declining balance depreciation, and we used the BEA's estimated service lives for the various components.[21] For vehicles, we took the depreciation rates for the corresponding business categories estimated by Hulten and Wykoff.

Our estimates of the various components of the private capital stock are presented for selected years in 1985 dollars in table 6.5. Our value for the total private capital stock in 1985 is $11.0 trillion, which is 16 percent above that of the BEA.[22]

Regardless of whether one takes our estimates or those of the BEA, the government sector clearly owns a large fraction of our national capital stock. As shown in figure 6.8 and table 6.5, total government tangible capital is 27 percent of the size of the private capital stock and 55 percent as large as the stock of private nonresidential structures, equipment, and inventories. A comparison of government and private net investment is made in figure 6.9. Government investment is much less cyclical than private investment and actually exceeded total private nonresidential investment in 1982.

6.5 New Estimates of Adjusted GNP, NNP, Government Consumption, Saving, and Investment

The discussion above highlights the size of the government capital stock and investment. Governments create a large share of the national capital formation, and the failure to include the imputed return on government capital seriously distorts measures of total consumption and income. The inappropriate treatment of consumer durables also distorts our understanding of investment, income, and consumption. These issues are well known (see, e.g., David and Scadding 1974; Boskin 1986; Eisner and Nebhut 1982; Kendrick 1976; and Holloway,

Table 6.5 **New Estimates of Net Stocks of Private and Government Reproducible Capital, Excluding Revaluations (billions of 1985 dollars)**

Year	Private Nonresidential (1)	Private Residential (2)	Consumer Durables (3)	Total Private = (1) + (2) + (3) (4)	State-Local (5)	Federal (6)	(5) + (6) as % of (1) (7)	(5) + (6) as % of (4) (8)
1928	1,552.0	1,324.1	105.0	2,981.1	307.3	82.2	25.1	13.1
1935	1,495.2	1,336.3	88.8	2,920.3	403.9	108.8	34.3	17.6
1945	1,576.0	1,382.5	96.8	3,055.3	489.8	960.2	92.0	47.5
1955	2,146.9	2,008.2	227.1	4,382.2	679.1	685.8	63.6	31.1
1965	2,861.5	2,816.5	333.4	6,011.4	1,099.7	763.5	65.1	31.0
1975	4,102.1	3,754.0	581.7	8,437.8	1,618.5	802.6	59.0	28.7
1985	5,281.7	4,817.3	899.2	10,998.2	1,863.2	1,064.9	55.4	26.6

Sources: Private nonresidential capital includes our estimates of fixed private nonresidential capital and inventories. Inventory data are from *Economic Report of the President* (1986, table B-17); 1982 constant dollar stocks were updated to 1985 dollars by multiplying by the ratio of 1985 current to constant (1982) dollar stock.

Our estimates of the private fixed nonresidential capital stock may be considered an updating of those in Hulten and Wykoff (1981). We use gross investment data from the 1986 BEA wealth data tape. We assume geometric depreciation patterns and generally use the depreciation rates estimated by Hulten and Wykoff. For asset categories for which depreciation rates were inferred by Hulten and Wykoff from the average relations $d = 0.91/$ (service life) for structures and for which the BEA estimated service lives have been revised, as reported in Gorman et al. (1985), we calculated revised depreciation rates. Where there are now multiple service lives for asset subcategories within a type of capital, we have used the subcategory service life closest to the previous single service life for the asset type to infer a single depreciation rate. We convert our constant dollar estimates from 1982 to 1985 dollars by using the price indices implicit in BEA current- and constant-cost estimates for each asset type.

Our estimates of net private residential capital are based on BEA gross investment and service life data and a geometric depreciation rate of $0.91/$ (service life), which is the average relation for nonresidential structures found by Hulten and Wykoff (1981). Gross investment data are from the 1986 BEA wealth data tape and the BEA detailed industry investment tape. BEA service lives are listed in Gorman et al. (1985).

For consumer durables, our estimates use BEA gross investment data from the 1986 BEA wealth data tape and employ BEA estimated service lives to infer geometric depreciation rates for some assets (see Musgrave 1979). For durables other than vehicles, we assume double-declining balance depreciation. For vehicles, we use the depreciation rates for the corresponding business categories estimated by Hulten and Wykoff. Again, our 1982 dollar estimates are updated to 1985 dollars by using price indices implicit in the BEA current and constant dollar data for each type of consumer durable.

Government reproducible capital includes equipment, inventories, and all structures. See source notes to tables 6.1 and 6.4

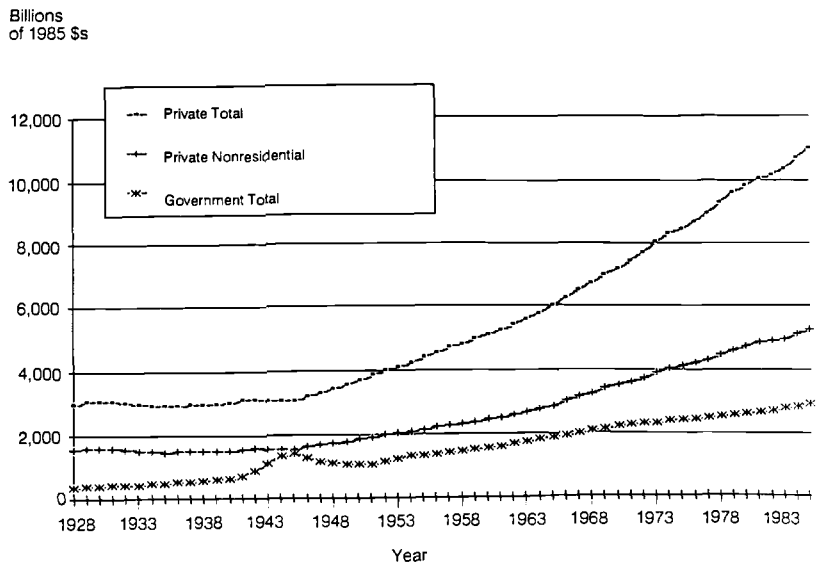

Fig. 6.8 New estimates of net stocks of private and government reproducible capital

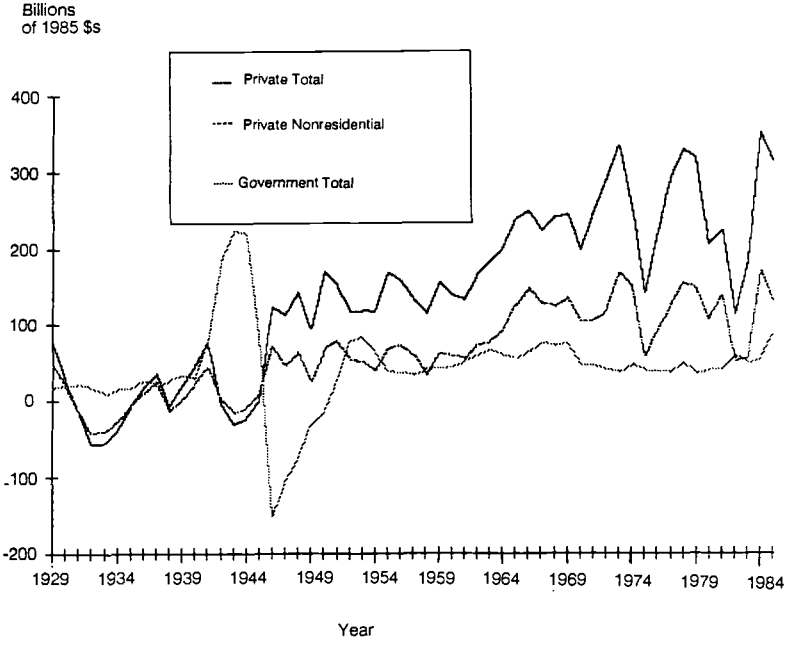

Fig. 6.9 New estimates of net investment in private and government reproducible capital

chap. 1, in this vol.). In this section, we present estimates of GNP and NNP including imputed rent to durables and government capital and adjusted estimates of government and private consumption and saving and investment rates. The advantages of the work reported here, relative to earlier studies, include the following.

1. The estimates of government and private depreciation are consistent with the best available empirical evidence.

2. The depreciation assumptions are internally consistent; that is, the estimates of rental prices of capital services are consistent with the corresponding estimates of capital stock. Unfortunately, the depreciation estimates of the BEA capital stock series and those used in the NIPAs are based on an internally inconsistent set of estimates of depreciation, stemming from Denison (1957). Jorgenson and Griliches (1972) pointed out long ago that the Denison/NIPA approach to estimating depreciation is consistent with the basic economic concept of depreciation only if the relative efficiencies of capital of different ages decline geometrically.

3. We impute a constant 3 percent real rate of return net of depreciation and maintenance to government capital and consumer durables. Given the illiquidity of most government capital and consumer durables, it is unlikely that the service flow from these assets fluctuates with any short-term variation in the real interest rate. A sensitivity analysis showed only very minor changes to variations in the assumed real interest rate.[23]

4. We include an imputed return for government land.

Table 6.6 presents a reconciliation for 1985 of GNP, NNP, private consumption, saving, and investment, and government consumption, saving, and investment based on the adjustments we have made. While real net revaluations might be included in net saving and investment, we do not do so here. First, these estimates are more readily comparable to the traditional figures. Second, we may wish to compare direct investment spending with various variables, not presuming revaluations were being forecast and used in decision making. Further, they are more important for year-to-year variation than cumulatively. Finally, we often compare saving or investment to government borrowing. In the sections that follow, we develop more comprehensive measures of changes in real assets and liabilities. One might well wish to compare, for example, government investment with the change in real net debt (the changes in the real value of financial liabilities in excess of financial assets) or even with an estimate of real "net worth." Again, we adopt the more conventional comparisons in this section, leaving the discussion of these other adjustments to subsequent sections. As can be seen, including the gross rent on government capital and consumer durables increases GNP by more than 10 percent, while including net rent and using our estimates of depreciation increases NNP by about 4 percent.

Table 6.6 **Comparison of Adjusted and Traditional NIPAs for 1985 (billions of 1985 dollars)**

	GNP and NNP	
	Adjusted	Traditional
GNP	3,998.1	3,998.1
Plus rent on government reproducible capital[a]	152.0	. . .
Plus rent on government land	25.5	. . .
Plus rent on consumer durables	317.1	. . .
Equals adjusted GNP	4,492.7	3,998.1
Less depreciation of private capital[b]	380.1	437.2
Less depreciation of government reproducible capital	97.1	. . .
Less depreciation of consumer durables	291.0	. . .
Equals NNP	3,724.6	3,560.9
	Government and Private Consumption	
Total government purchases	815.4	815.4
Plus rent on reproducible capital and land	177.5	. . .
Less government gross investment[c]	199.2	. . .
Equals adjusted government consumption	793.7	815.4
Personal consumption expenditures	2,600.5	2,600.5
Plus rent on consumer durables	317.1	. . .
Less gross investment in consumer durables	347.0	. . .
Equals adjusted private consumption	2,570.7	2,600.5
	Saving	
GNP	4,492.7	3,998.1
Less private consumption	2,570.7	2,600.5
Less government consumption	793.7	815.4
Less adjustments for net transfers and interest paid by government to foreigners and statistical discrepancy	30.8	30.8
Equals gross saving	1,097.6	551.5
Less depreciation of traditional private capital	380.1	437.2
Less depreciation of government reproducible capital	97.1	. . .
Less depreciation of consumer durables	291.0	. . .
Equals net saving	329.4	114.3

(continued)

Table 6.6 (continued)

	GNP and NNP	
	Adjusted	Traditional
	Investment	
Gross private investment[c]	639.9	661.1
Plus government gross investment in reproducible capital	187.1	. . .
Plus gross investment in consumer durables	347.0	. . .
Equals gross domestic investment	1,174.0	661.1
Less depreciation of private capital	380.1	437.2
Less depreciation of government capital	97.1	. . .
Less depreciation of consumer durables	291.0	. . .
Equals net domestic investment	405.8	223.9

[a]Rent equals opportunity cost plus depreciation. We assume a constant real interest rate of 3 percent in calculating opportunity cost for government capital and consumer durables. We apply this discount rate to mid-year stocks for year t obtained by averaging the end-of-year stocks for years t and $t - 1$. Because the return on government enterprise capital is, at least in theory, already included in GNP, we do not include imputed rent on government enterprise capital in our expanded measures of government consumption and GNP. For further discussion, see Martin, Landefeld, and Peskin (1982). All depreciation estimates used in the adjusted calculations are the authors', as described in secs. 6.2 and 6.4

[b]This entry includes private equipment and nonresidential and residential structures. Consumer durables are listed separately. Inventories are assumed not to depreciate. The adjusted estimate is from the authors' calculations, while the "traditional" entry is the NIPA capital consumption allowance.

[c]In the adjusted calculations, gross investment data for fixed reproducible capital and consumer durables are from the 1986 BEA wealth data tape, with our conversion to 1985 dollars based on BEA price indices. These series differ slightly from the NIPA series from which they are derived because of adjustments for intersectoral transfers, for instance. Most of the difference between the gross private investment series presented here is in equipment. Government inventory investment is measured as the change in year-end stocks, based on BEA data converted to 1985 dollars. Government gross investment in land is based on estimates of yearly net acquisitions (see sec. 6.8 for a discussion of our land estimates) and does not include revaluations.

Government consumption likewise is slightly different from government purchases of goods and services, as the rent on government capital was about $20 billion smaller than government gross investment. Private consumption, however, is quite close to NIPA personal consumption expenditures, as the estimated rental flow of services from the stock of consumer durables in 1985 (but not in general) is close to gross investment in durables. To total gross investment, we add approximately $190 billion of government investment and almost $350

billion of consumer durable investment. Thus, total gross investment is almost 80 percent larger than gross private investment as traditionally reported in the NIPA. Using our depreciation estimates, both for traditional private investment and for government capital and consumer durables, yields adjusted net national investment of $406 billion, also 80 percent larger than the NIPA figures.

Turning to saving, gross saving substantially exceeds NIPA gross private saving, about $1.1 trillion compared to $551 billion. NIPA net saving of $114 billion is only about one-third of our adjusted net saving.

Corresponding differences would be found in saving, investment, and consumption rates, although recall that NNP and GNP are slightly larger than the NIPA figures, so the proportionate increases would be slightly less. Table 6.7 presents estimates of U.S. saving and investment from 1951 to 1985, using our adjusted accounts, as percentages of adjusted GNP. For the three decades from 1951 to 1980, we present simple averages of annual figures for the decade.[24]

The data reveal some interesting trends in total net saving and total net investment in the United States. Total net saving, while substantially higher than the traditional NIPA figures, has declined substantially relative to the 1950s and 1960s. It declined about 15 percent between the 1950s and 1960s, on the one hand, and the 1970s, on the other, and has deteriorated markedly in the 1980s. By 1985, the third year of an expansion, the total net saving rate, expanded to include government saving and saving in the form of consumer durables, was almost 40 percent below the average for the 1950s and 1960s. Net private saving (also substantially larger than the corresponding NIPA figures because of the inclusion of net saving in consumer durables) was only slightly below historical levels in 1984–85. Net government saving, however, which averages a substantial fraction of GNP in the 1950s and 1960s and a modest fraction in the 1970s, turned negative from 1982 to 1985.

Federal government net saving turned sharply negative and more than offset state and local government saving. Note here that saving is defined to adjust the traditional surplus or deficit figures for net investment. It is interesting to note, for example, that, while the federal government borrowed 4.4 percent of adjusted GNP in 1985, federal government net investment was estimated as 1.4 percent of GNP, about one-third of the deficit figure. Whether the value of these assets the federal government was accumulating is properly measured by purchase price and should be thought of as representing a substantial available set of public assets to offset the growing public liabilities represented by the deficits is a question we do not address here.

The state and local government sector has always been a large net saver. In the period 1951–80, this was primarily because of net investment, for example, in educational buildings. In the 1980s, the

Table 6.7 **Adjusted U.S. Saving and Investment, 1951–85 (as a percent of expanded GNP and taken from current dollar calculations)**

	1951–60	1961–70	1971–80	1981	1982	1983	1984	1985
Total net saving	11.5	11.4	9.9	8.0	5.2	5.1	7.7	7.2
Net private saving	8.9	9.6	9.3	7.6	6.6	7.5	8.8	8.3
Net government saving	2.6	1.7	.7	.4	−1.4	−2.4	−1.2	−1.1
Federal government saving	1.3	−.0	−1.1	−1.1	−2.8	−4.0	−3.3	−3.0
Federal government net investment	1.4	.4	.5	.7	1.3	.6	.8	1.4
Federal government surplus	−.1	−.4	−1.6	−1.9	−4.1	−4.6	−4.0	−4.4
State-local government saving	1.3	1.7	1.8	1.5	1.4	1.7	2.1	1.9
State-local government net investment	1.4	1.7	1.0	.5	.4	.4	.5	.6
State-local government surplus	−.2	.0	.8	1.0	1.0	1.2	1.6	1.4
Total net investment	11.6	11.3	9.9	8.1	5.2	5.3	7.6	7.1
Net foreign investment	.4	.9	−1.1	−.1	.1	−1.0	−2.0	−1.9
National domestic investment	11.2	10.4	11.0	8.2	5.1	6.2	9.6	9.0
Private domestic investment	8.3	8.3	9.5	6.9	3.4	5.2	8.3	7.1
Government net investment	2.9	2.1	1.5	1.3	1.7	1.0	1.2	1.9
Federal government net investment	1.4	.4	.5	.7	1.3	.6	.8	1.4
State-local government net investment	1.4	1.7	1.0	.5	.4	.4	.5	.6
Memo: Gross national saving	27.6	26.5	26.2	25.4	23.3	22.6	24.6	24.4
Gross private saving	22.1	22.6	23.5	22.9	22.6	22.8	23.7	23.3
Gross government saving	5.5	4.0	2.7	2.5	.8	−.2	.9	1.1
Total capital consumption	16.1	15.2	16.3	17.4	18.1	17.5	16.9	17.2
Private capital consumption	13.2	12.9	14.2	15.4	15.9	15.4	14.8	15.0
Government capital consumption	3.0	2.3	2.1	2.1	2.2	2.2	2.1	2.2
Federal government capital consumption	2.2	1.4	1.0	1.0	1.1	1.1	1.1	1.2
State-local government capital consumption	.8	.9	1.1	1.1	1.1	1.0	1.0	1.0

Note: Our adjustments to NIPA measures to better account for government capital and consumer durables are described in the source note to table 6.5 and in the text. Here we use current dollar data and present our saving, investment, and capital consumption series as percentages of expanded GNP, i.e., NIPA GNP expanded to include rental flows from general government capital and consumer durables. For the three decades from 1951 to 1980, we present simple averages of annual figures for the decade.

Government saving equals the traditionally measured budget balance plus government net investment in reproducible capital and land. Our net investment estimates and the capital consumption figures reported use our estimates of the depreciation of government capital, fixed private capital, and consumer durables; the latter is included here in "private capital consumption."

pattern has changed. Net investment by state and local governments has fallen to one-third of its earlier historical level, perhaps desirably so in view of changing demographics. Counteracting this has been the swing to a very substantial state and local surplus, although the latter is heavily concentrated in pension plans, whose simultaneously accruing liabilities are not accounted for in these data.

Net investment in the United States has been more stable than national saving. Domestic investment was actually a higher fraction of national product in the 1970s than in the 1960s. The net domestic investment rate in 1984–85 was only 14 percent below its level from 1951 to 1980, compared with a 32 percent drop in net saving rates. Making up for much of the savings decline, of course, has been the substantial decline in net foreign investment (due both to a decrease in U.S. investment abroad and an increase in foreign investment in the United States), the other side of the trade deficit. Over 20 percent of domestic investment was financed from abroad in 1984–85.

Government net investment in 1985 was about at the same ratio of national income as it was over the previous three decades, although state and local government net investment had fallen substantially. Federal government net investment heavily reflects the military buildup; in 1985, federal investment was at a level not attained since the 1950s.

It is worth mentioning that gross saving and investment rates were in the low to mid-20 percent range with the expanded definitions, with total capital consumption having risen from 15–16 percent in the 1951–80 period to 17–18 percent in the 1980s. Two-thirds of the difference between the net saving rates in the 1960s and those in the 1980s is attributable to an increased rate of capital consumption. A similar rise is reported in the NIPAs, but the gross saving, gross investment, and depreciation figures are all substantially higher under the expanded definitions.

We present, in table 6.8, estimates of gross and net saving rates on various adjusted bases. We start with the traditional NIPA basis, show the rates on an OECD basis (including government nonmilitary investment but neither government military investment nor consumer durables), and move to broader definitions. While the trends in these rates are important, perhaps at least as important is the fact that traditional comparisons between the United States and other countries are marred by numerous comparability problems, among the most important of which is the differential role played by government relative to private capital formation and net investment, especially military investment, on the one hand and consumer durable purchases on the other. These comparisons are particularly misleading with respect to Japan (see Boskin and Roberts 1986).

Table 6.8 **Gross and Net Saving Rates, Selected Years**

	Gross National Saving/GNP			
	Exclude Government Nonmilitary Investment and Consumer Durables (NIPA basis)	Include Government Nonmilitary Investment in Fixed Reproducible Capital (OECD basis)	Include Government Nonmilitary Investment in Fixed Reproducible Capital and Consumer Durables	All Government Investment and Consumer Durables
1950	17.8	20.3	24.7	23.9
1960	15.0	18.3	21.9	22.9
1970	13.8	16.8	21.3	21.8
1980	16.4	18.1	23.2	24.0
1985	13.8	15.5	22.2	24.3
	Net National Saving/NNP			
1950	11.7	13.2	14.6	11.8
1960	8.2	10.6	10.9	11.1
1970	6.2	8.2	8.8	8.7
1980	7.7	8.5	8.7	9.2
1985	4.7	5.5	7.0	8.8

Note: These estimates are derived from our 1985 constant dollar adjustment of the NIPAs to account for government capital and consumer durables. Denominators (GNP and NNP for gross and net saving rates, respectively) in each column have been expanded to include the rental flows associated with the types of government investment included in the numerator. The depreciation estimates used are from our calculations, as described earlier. For this reason, the net saving rates reported here in col. 1 differ from those calculated from NIPA data, which obviously use the NIPA capital consumption allowance instead.

As the data in table 6.9 and Figure 6.10 reveal, private consumption as a share of NNP has risen from 62.9 percent in 1950 and 63.7 percent in 1960 to 69.0 percent in 1985. This 6 percentage point rise—about a 10 percent increase—is close to the volume of traditional net private saving. Had private consumption remained at its 1950–60 ratio and the government sector been unchanged, net private saving would have been almost doubled in 1985.

Government consumption, as shown in figure 6.11, remains about 25 percent of NNP throughout the 1950s and 1960s but has since declined to only 21.3 percent by 1985. This aggregate marks a 10 percentage point decline in federal government consumption since the Korean War (despite the growth of the government capital stock) and a 4 percentage point rise in state and local government consumption. The former heavily reflects the growth of federal transfer payments (which by the mid-1970s exceeded purchases of goods and services) and the latter the demographic pressure of the baby boom on government spending on education.

The share of NNP devoted to national consumption has risen from about 86 percent in 1950 to over 90 percent by 1985. Though the consumption ratio has fluctuated substantially, partly for cyclical reasons, the continued upward trend is marked.

While the share of national product devoted to consumption has risen, the government's role in the trend is complex. While direct government consumption has fallen, part of the increase in the private consumption rate undoubtedly reflects the incentives created by growing government transfer payment programs and by tax policies. Thus, the decline in the national saving rate alluded to earlier reflects both the growth of the private consumption ratio, partly resulting from government transfer payment growth, and the decline in the net saving rate of the government sector—indeed, its shift to net dissaver—resulting both from historically large federal deficits and from the decline in state and local government net investment.

Table 6.9 **Private, Government, and National Consumption as Percentage of Expanded NNP, Selected Years**

	Private Consumption/ NNP	Government Consumption/NNP			National Consumption/ NNP
		Total	Federal	State-Local	
1950	62.9	23.5	13.8	9.7	86.4
1960	63.7	25.1	14.4	10.7	88.8
1970	65.4	25.6	12.7	12.9	91.0
1980	67.9	22.0	8.6	13.4	89.8
1985	69.0	21.3	8.7	12.6	90.3

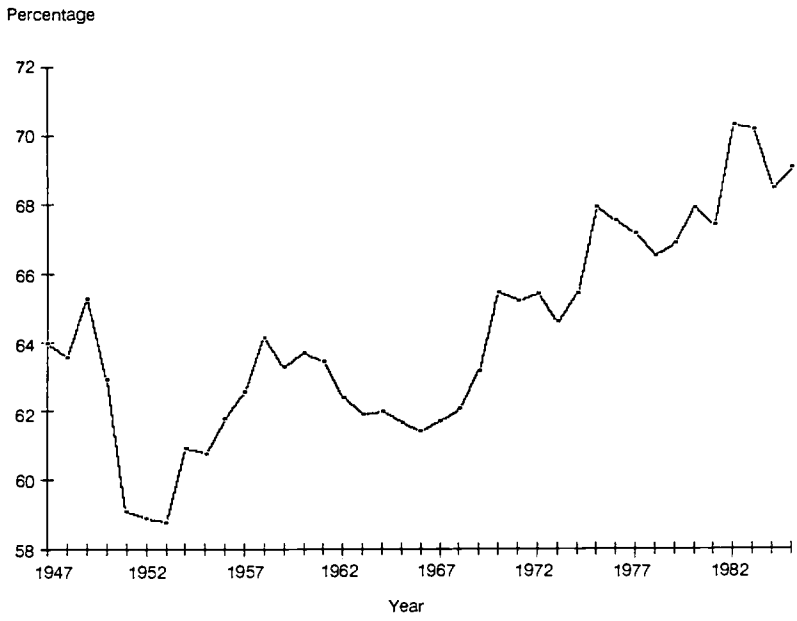

Fig. 6.10 Adjusted private consumption as a percentage of expanded net national product

6.6 Government Financial Assets and Liabilities

The federal debt receives enormous attention from the press and public. Little noticed is that governments also hold substantial financial assets as well as off-budget liabilities. Though, as Boskin (1982) argues, the appropriate definition of deficits depends on the question being asked, the conventional measures of debt and deficits are not accurate answers to almost any of them.

The Federal Reserve's flow-of-funds accounts present balance sheets with financial assets and liabilities for both the federal and the state and local governments. As Eisner and Pieper (1984) point out, these figures should be adjusted to reflect their market, rather than the par, value. They make a series of careful adjustments to the various components on the balance sheet.[25] Eisner (1986) updates the par-to-market conversions and extends them to state and local governments. The conversion factors are particularly large during periods of increasing inflation and interest rates, like 1980.[26]

Financial assets and liabilities in 1985 are presented for both levels of government in table 6.10. We have made only Eisner and Pieper's par-to-market corrections to the flow-of-funds accounts.[27] The federal government had more than $1 trillion in financial assets. More than

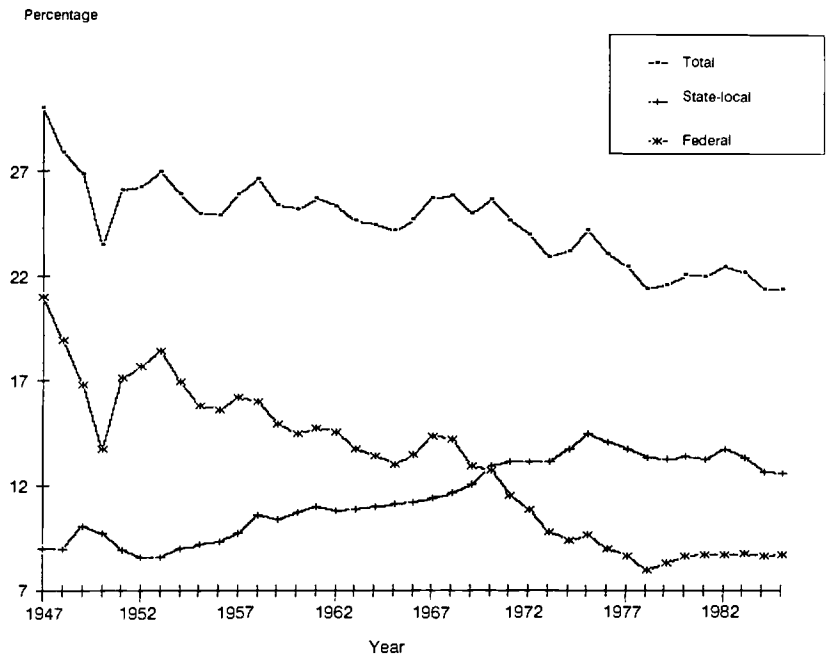

Fig. 6.11 Government consumption as a percentage of expanded net national product

half these were loans, but there was also more than $140 billion in cash, time deposits, and gold. Conventional debt also understates liabilities, which include more than $250 billion in agency debt. State and local government financial assets exceeded $450 billion and were within $100 billion of their financial liabilities. Nearly half of state and local financial assets were federal government liabilities.

Figures 6.12 and 6.13 show the trends in financial assets and liabilities for the two sectors in 1985 dollars. Federal financial liabilities fell rapidly after the war, then changed relatively little in real terms through 1981. At the same time, federal financial assets were gradually rising in real terms. The difference, called by Eisner the "net debt," was less than $600 billion in 1980, only slightly above its postwar low. In the last few years, of course, federal liabilities have exploded, and in 1985 they exceeded the 1945 peak for the first time. Since financial assets grew by only 10 percent, the net debt, as shown in table 6.11, grew by 145 percent.

State and local government financial liabilities grew more rapidly than financial assets through 1971. Liabilities fell sharply in real terms in the late 1970s, while financial assets continued their steady growth, so that net debt in 1985 was $66 billion, less than one-third its peak.

Table 6.10 **Government Financial Assets and Liabilities, 1985 (billions of 1985 dollars)**

	Federal
Financial assets:	
Currency, demand, and time deposits	53.4
Gold	86.4
Foreign exchange and special drawing rights	32.1
U.S. government securities	205.8
Treasury issues	194.3
Agency issues	11.5
Mortgages	224.9
Other loans	317.7
Taxes receivable	10.6
Miscellaneous assets	100.2
Total financial assets	1,031.1
Financial liabilities:	
Treasury currency and special drawing rights certificates	18.0
Demand deposits and currency	182.4
Bank reserves and vault cash	54.1
Credit market instruments	1,954.2
Treasury issues	1,590.1
Agency issues	279.4
Savings bonds	84.7
Insurance, retirement reserves	159.0
Miscellaneous liabilities	92.3
Total financial liabilities	2,460.0
Net debt	1,428.9
	State-Local
Financial assets:	
Currency, demand, and time deposits	78.0
Security repurchase agreements	48.8
U.S. government securities	231.8
Treasury issues	166.3
Agency issues	65.5
State and local obligations	8.3
Mortgages	78.3
Taxes receivable	21.1
Total financial assets	466.3
Financial liabilities:	
State and local obligations	482.6
Short term	18.5
Other	26.8
U.S. government loans	26.8
Trade debt	23.0
Total financial liabilities	532.4
Net debt	66.1

Sources: Par-to-market indices kindly provided by Paul Pieper and described in an appendix to Eisner (1986) were applied to end-of-year 1985 data on government financial assets and liabilities contained in the Federal Reserve flow-of-funds accounts. See text.

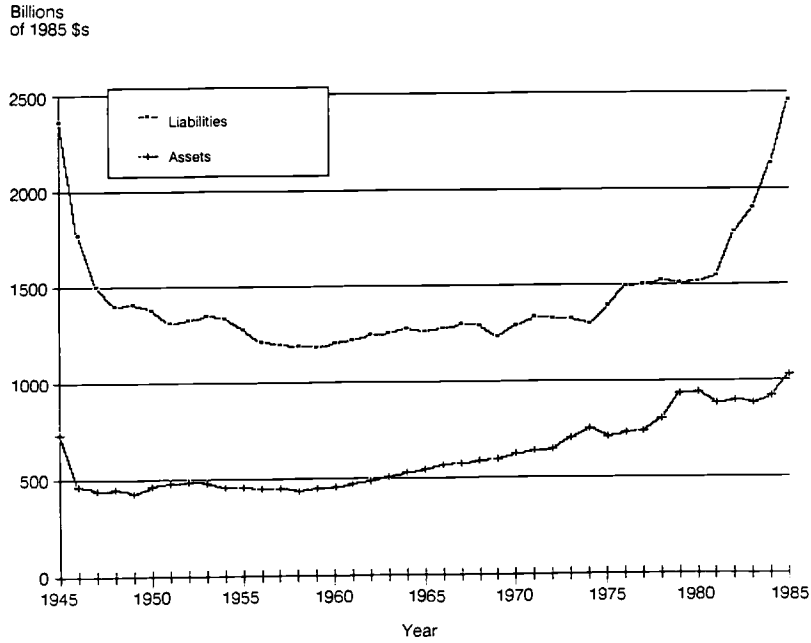

Fig. 6.12 Federal financial assets and liabilities

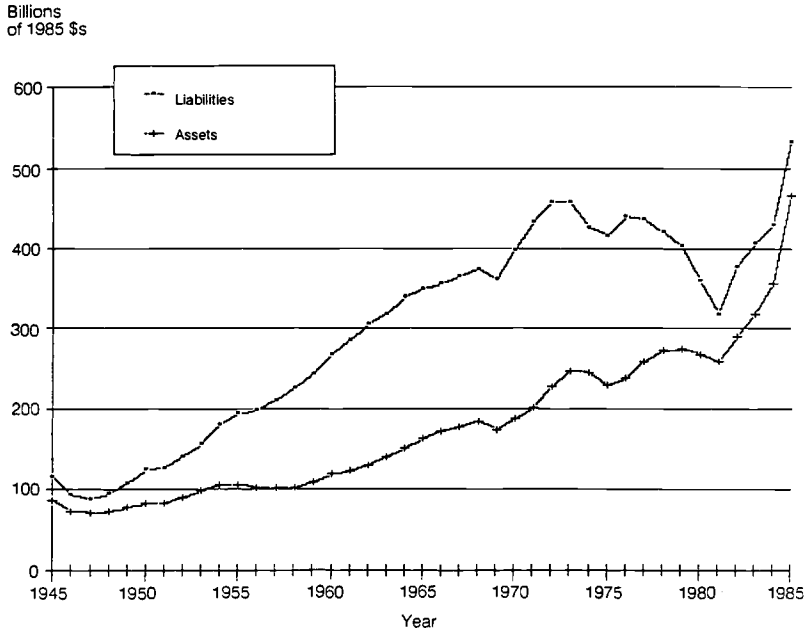

Fig. 6.13 State and local financial assets and liabilities

Table 6.11 **Net Debt and Change in Net Debt for Federal and State-Local Governments (billions of 1985 dollars)**

Years	Federal Net Debt	Change in Federal Net Debt	State-Local Net Debt	Change in State-Local Net Debt
1946	1,309.3	−325.6	20.7	−9.2
1947	1,059.9	−249.4	16.7	−4.0
1948	950.4	−109.5	21.8	5.1
1949	980.6	30.2	29.9	8.2
1950	917.9	−62.7	41.6	11.7
1951	833.5	−84.4	43.2	1.6
1952	842.3	8.8	50.4	7.2
1953	865.6	23.2	57.4	7.0
1954	877.5	11.9	75.2	17.8
1955	817.6	−59.8	89.5	14.4
1956	758.8	−58.8	94.6	5.1
1957	749.3	−9.6	108.2	13.6
1958	753.3	4.0	123.4	15.1
1959	731.9	−21.4	134.1	10.8
1960	749.0	17.1	148.9	14.8
1961	753.3	4.3	163.6	14.7
1962	760.9	7.6	175.4	11.8
1963	744.3	−16.6	177.9	2.5
1964	746.3	1.9	187.4	9.5
1965	719.4	−26.8	187.4	−.0
1966	710.4	−9.0	185.4	−2.0
1967	720.3	9.9	188.6	3.1
1968	704.3	−16.0	191.1	2.6
1969	633.7	−70.6	188.0	−3.1
1970	668.6	34.9	209.8	21.8
1971	697.1	28.5	231.7	21.9
1972	684.4	−12.7	229.9	−1.8
1973	621.5	−62.9	210.8	−19.1
1974	550.6	−70.8	181.0	−29.8
1975	675.1	124.5	187.0	6.1
1976	762.3	87.2	203.2	16.2
1977	764.6	2.4	178.3	−25.0
1978	715.5	−49.1	148.2	−30.0
1979	570.6	−145.0	128.5	−19.7
1980	574.5	4.0	91.2	−37.2
1981	664.0	89.5	59.4	−31.8
1982	882.1	218.1	87.3	27.9
1983	1,015.1	133.0	88.9	1.5
1984	1,215.3	200.2	73.0	−15.9
1985	1,428.9	213.6	66.1	−6.9

Sources: Net debt is defined by Eisner as the excess of government financial liabilities over financial assets. Current dollar series on the estimated market value of government financial liabilities and assets for 1945–84 are taken from Eisner (1986) and converted into 1985 dollars via the GNP deflator. The differences in these series for federal and state-local governments are reported here as net debt. Estimates for 1985 are from table 6.10.

6.7 Government Oil and Gas Mineral Rights

Governments own a large fraction of the mineral rights in the United States. Federal and state governments own all mineral rights on offshore and tidal lands. In addition, all levels own the mineral rights under government land. For consistent accounting, the value of these assets should be counted as wealth, and revenues from government-owned lands should be charged as sales of the assets.

Oil and gas rights are by far the most valuable to the government sector, though other minerals, particularly coal, may be more valuable in some states. For the federal government, we correct, update, and convert to 1985 dollars the estimates of the value of oil and gas rights made by Boskin et al. (1985).[28]

When a government leases the mineral rights in a particular area—rights essentially to as yet undiscovered resources—it has reduced its mineral wealth by transferring claims to part of it to the private sector. In return, the government receives some payment immediately in the form of a bonus, with the rest of the payments deferred as royalties or rental payments. Bonuses are cash payments that are not conditional on the existence or size of the resource and are typically the variable subject to bidding. Royalty payments are fractions, usually fixed in advance, of the gross revenue of the produced output, if any. By the time reserves are "proven," their only value to the government is the present value of royalties they represent.[29]

The method used by Boskin et al. (1985) takes advantage of several institutional and theoretical characteristics of oil and gas production to value federal oil and gas rights with the limited information available.[30] The base-year value of oil and gas rights to the government is the sum of three components: future royalties on proven reserves, future royalties on estimated undiscovered reserves, and future bonuses on unleased land. Fortunately, royalties are historically fixed percentages of the gross revenues. Since the percentage is known, forecasting royalties requires forecasting production and prices. By definition, expected future production, with current prices and technology, is the sum of proven and estimated undiscovered reserves. Since oil and gas are exhaustible resources, there are theoretical, as well as empirical, reasons to expect increasing real prices. Boskin et al. assume that real prices will grow at the real rate of interest since this is both convenient and roughly consistent with historical evidence and theory.[31] Bonuses on unleased land are assumed to be proportional to royalties on undiscovered resources.

Boskin et al. (1985) obtain the value of federal oil and gas rights in other years by making two additional assumptions. First, the quantity of oil and gas reserves changes only with production.[32] Second, the expected future price path at any date is proportional to actual prices

at that date.[33] With these assumptions, capital gains or losses are proportional to price changes, and the change in value from year to year is the capital gain less bonuses and royalties received.

The corrected values of federal oil and gas rights, converted to 1985 dollars using the GNP deflator, are given in table 6.12. The magnitudes are enormous, particularly after the second oil shock. The 1980 value

Table 6.12 **Value of Federal Oil and Gas Mineral Rights (billions of 1985 dollars)**

Year	Total	Oil	Gas	Change in Value
1954	247.2	197.1	50.0	
1955	239.0	189.8	49.2	−8.2
1956	234.1	184.5	49.6	−4.9
1957	247.1	196.9	50.2	13.0
1958	239.9	188.1	51.8	−7.2
1959	230.7	176.4	54.3	−9.2
1960	229.5	171.8	57.7	−1.2
1961	231.9	170.5	61.5	2.4
1962	226.8	165.7	61.2	−5.1
1963	223.3	162.4	60.9	−3.5
1964	216.9	158.6	58.3	−6.4
1965	209.8	152.7	57.1	−7.1
1966	202.9	147.8	55.1	−6.9
1967	198.8	144.7	54.0	−4.2
1968	186.6	135.2	51.5	−12.2
1969	182.9	133.6	49.3	−3.7
1970	174.7	128.0	46.7	−8.3
1971	175.0	128.3	46.7	.4
1972	161.6	118.0	43.6	−13.4
1973	166.7	121.6	45.1	5.1
1974	243.0	188.5	54.5	76.3
1975	261.0	189.3	71.6	18.0
1976	273.7	187.7	86.1	12.7
1977	289.3	180.9	108.4	15.6
1978	287.9	173.7	114.1	−1.4
1979	350.7	217.3	133.3	62.8
1980	492.7	328.5	164.2	142.0
1981	618.2	430.3	187.9	125.5
1982	612.2	393.7	218.5	−6.0
1983	571.6	348.7	222.9	−40.7
1984	537.7	327.2	210.5	−33.9
1985	491.5	288.9	202.6	−46.2
1986	334.8	172.2	162.6	−156.7

Sources: The value of oil and gas rights for 1981 was obtained from estimates of proven and undiscovered, but economically recoverable, reserves on federal land, 1981 prices, royalty rates, and historic ratios of bonuses to future royalties. The values for other years were obtained by adjusting for bonuses and royalties paid and price changes. A detailed description of the methodology and underlying assumptions, as well as sensitivity analyses, is given in Boskin et al. (1985). The series was converted to 1985 dollars using the GNP deflator.

is the largest of any single asset on the federal balance sheet, substantially higher than structures, gold, mortgages, or inventories. It is almost as large as the net federal debt in that year. Even after the dramatic drop in world oil prices, we estimate the value of federal oil and gas rights exceeded one-third of a trillion dollars in 1986. As figure 6.14 shows, changes in the value of federal rights can also be large, occasionally exceeding the conventionally measured budget deficit. Some volatility is appropriate since the method is designed to give a contemporaneous estimate of the value of mineral rights.

Before turning to state and local mineral rights, let us add some caveats. Our calculations are sensitive to estimates of undiscovered, economically recoverable reserves. As shown in Boskin et al. (1985), the value of oil and gas rights could be up to 39 percent higher or 29 percent lower if one took the 5 percent or 95 percent bounds calculated by the U.S. Geological Survey (1981). The estimates are also sensitive to the assumptions on price growth.[34]

Since state and local governments do not appear, for the most part, to keep records on either production or reserves on state-owned lands, it is difficult to make estimates of the value of oil and gas rights for them. We have obtained information from three states that account for more than 60 percent of U.S. oil production and a higher fraction of

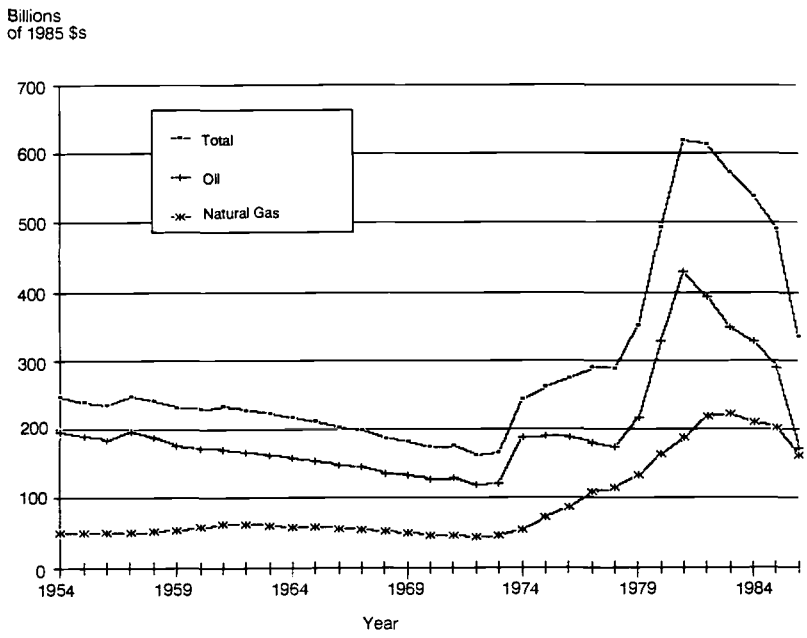

Fig. 6.14 Value of federal oil and gas rights

the value of state-owned oil and gas rights: Alaska, Texas, and California.[35]

By far the most valuable oil and gas rights are owned by the state of Alaska. More than 99 percent of Alaska's production is on state-owned land; this compares to an estimated 6.5 percent for Texas and 1.8 percent for California.[36] Since essentially all Alaska's production is on state-owned land, it is artificial to treat taxes on petroleum differently from royalties. If the severance tax rate were lower, for example, royalty rates could be raised by the same amount without changing production or state revenues. Even the corporate tax on oil companies should be viewed as payment for oil rights; oil companies pay more than 90 percent of corporate income taxes, and the formula for calculating the base was changed to maximize the take from the oil producers.[37] Accordingly, we include all petroleum taxes and royalties as part of the value of rights.

In 1985, Alaska's revenues from petroleum were $3.1 billion, or $4.64 per barrel produced. Alaska had 7.1 billion barrels of proven oil reserves, so, under the price growth assumption of Boskin et al. (1985), these alone were worth at least $32.9 billion in 1985.[38] Alaska was estimated to have 6.9 billion barrels of undiscovered, economically recoverable oil onshore. If this was all on state land, the value of oil rights would have been $65 billion in 1985. Finally, the state was estimated to have 71 trillion cubic feet of natural gas either proven or undiscovered. If the value to the state of 10,000 cubic feet of gas were the same as a barrel of oil, this would make the total value of Alaskan oil and gas rights $98 billion in 1985.[39]

By comparison to Alaska, even Texas looks small. The average royalty rate on state-owned land was 12 percent, and the severance tax rates were 4.6 percent for oil and 7.5 percent for gas.[40] If the reserve-to-production ratio is the same on private and state-owned land, the value of proven reserves of oil and gas on state land in 1985 was $2.2 and $1.6 billion, respectively.[41] If state land contains the same fraction of undiscovered reserves as of production, the total value of Texas's oil and gas rights was roughly $12 billion in 1985.[42]

Since California has much smaller proven and estimated undiscovered reserves, and since the state owns a much smaller fraction of those reserves, the value of California's rights is lower by an order of magnitude. The state collects an average royalty of 16.5 percent. Under Boskin et al.' (1985) assumptions, the value of California's oil and gas rights was $0.8 billion in 1985 if the ratio of both undiscovered and proven reserves to production was the same on private and on state land.

Our estimates of the total value of oil and gas rights in 1985 owned by the three states for which we have data is $110.8 billion. Using the method described by Boskin et al. (1985), we adjust for royalty and

bonus payments and price changes to create current dollar estimates for earlier years. Converting the estimate to 1985 dollars using the GNP deflator, we obtain an estimate for state oil and gas rights in 1980 of $125 billion. We wish to stress, however, that data limitations forced several assumptions about the quantity and value of oil and gas reserves, both proven and undiscovered, on state land. In addition, we are limited to three states—the most important omission being Louisiana—and, because of a lack of royalty data, to the 1980s. Our 1980 estimate of the value of state oil and gas rights exceeds our figures for the value of any single category of financial asset on the state and local balance sheet or the value of state and local residential structures, equipment, and inventories combined.

6.8 Government Land

Governmental units own substantial amounts of land in the United States, with the federal government alone holding nearly one-third of the nation's land area. In this section, we present annual estimates of the value of federal and state-local land from 1946 to 1985.[43] The estimates for 1946–51 are taken from Goldsmith (1962) and those for 1952–68 from Milgram (1973). Our contribution is to update these series from 1969 forward. In doing this, we follow Milgram's basic methodology, with some modifications.

Unfortunately, the data available on acreage and market values of government land are incomplete, especially for state and local governments, and not entirely reliable. Like Goldsmith and Milgram, we use these data to update estimates made for 1946 by Reeve et al. (1950), and more current and more rigorously derived benchmark estimates are desirable. These limitations restrict the degree of confidence that can be placed in any estimate of government land values.

The General Services Administration (GSA) publishes estimates of rural and urban acreage owned by the federal government and its original acquisition cost in its annual *Summary Report of Real Property Owned by the United States throughout the World.* These data are compiled from detailed inventory reports submitted by federal agencies. In 1985, the GSA estimated that the federal government owned 723.0 million acres of rural land and 3.7 million acres of urban land, which had a total acquisition cost of $12.9 billion. Given the significant share of national wealth accounted for by land, it is perhaps surprising that there is not a large body of carefully derived data on land prices. We construct a price index for federal rural land that gives equal weight to the U.S. Department of Agriculture's estimated average value of farmland and to stumpage prices paid for timber harvested in national forests. Our price index for federal urban land is based on the average

site price per square foot of one-family homes purchased with Federal Housing Administration (FHA)–insured mortgages. We estimate the value of federal urban and rural land in each year by applying our price index for each to the corresponding GSA acreage series.[44]

In table 6.13, we present estimates of federal, state-local, and total government land values for 1946–85. We have used the GNP deflator to convert the estimates drawn from Goldsmith (1962), Milgram (1973), and our calculations into 1985 dollars. We estimate the value of federal land in 1985 at $231.3 billion, with urban land accounting for more than three-fourths of the total value despite the fact that it constitutes only 0.5 percent of total acreage. (For a breakdown of the total federal land stock into rural and urban components, see table 6.14, and, for a chart of government land values, fig. 6.15.) The sizable increase in the federal total from $99.4 billion in 1968 results from an increase of about 160 percent in urban acreage, which is far more valuable than rural land, and from increases in both our land price indices that exceed the general inflation rate. The real value of federal urban land more than triples over 1968–85, and most of the increase occurs in 1970–74 and 1979–81. The rural land series primarily reflects price changes, and it increases gradually until the late 1970s and early 1980s and then decreases sharply. Our 1985 total value estimate is 8 percent lower than the peak attained in 1981.[45]

Less information is available on land owned by state and local governments; there are neither estimates of total acreage nor a breakdown between rural and urban components. Yet the significance of these land holdings is indicated by Milgram's finding that they were more than three times as valuable as federal land in 1968. Thus, it is important to update the previous work on state and local government land also. Here we follow Milgram's methodology almost exactly, partly because a paucity of data constrains us from doing otherwise. We construct one price index for all state and local land that gives equal weight to U.S. Department of Agriculture average farmland values and to the average site price per square foot of homes purchased with FHA-insured mortgages. To estimate acquisitions, we use a Census Bureau data series on state and local governments' "capital outlays for land and existing structures." Lacking other information, we follow Milgram in reducing these values by 10 percent to adjust both for the value of existing structures located on these lands that are purchased for continuing use and for sales of state and local government land, which are not reported separately in the data provided in the Census Bureau's annual *Governmental Finances*. We use this net acquisitions series A_t and our price series P_t to calculate the value of state and local land V_t as

$$V_t = V_{t-1}\left[\frac{P_t}{P_{t-1}}\right] + A_t.$$

Table 6.13 Estimates of Government Land Values (billions of 1985 dollars)

Year	Federal	State-Local	Total
1946	40.3	108.8	149.1
1947	42.0	108.2	150.1
1948	42.1	101.8	143.9
1949	43.3	97.4	140.7
1950	53.7	112.2	165.9
1951	59.6	107.7	167.3
1952	47.3	103.8	151.1
1953	46.4	121.6	168.1
1954	48.8	128.4	177.2
1955	50.3	147.4	197.7
1956	53.3	161.3	214.5
1957	55.3	178.6	233.9
1958	57.2	193.2	250.5
1959	61.0	207.1	268.2
1960	66.4	219.1	285.4
1961	73.6	237.3	310.9
1962	77.4	252.1	329.5
1963	82.3	268.8	351.1
1964	86.7	287.4	374.1
1965	90.1	297.8	388.0
1966	94.1	312.3	406.4
1967	98.1	324.5	422.6
1968	99.4	328.0	427.4
1969	112.1	331.6	443.7
1970	111.8	370.5	482.2
1971	132.6	358.9	491.5
1972	144.0	382.1	526.2
1973	167.6	396.8	564.4
1974	177.6	435.1	612.7
1975	175.6	447.9	623.5
1976	182.7	474.8	657.5
1977	200.5	521.4	721.9
1978	217.1	550.0	767.1
1979	217.6	590.0	807.6
1980	226.5	659.3	885.8
1981	252.7	704.6	957.2
1982	233.3	664.6	897.9
1983	238.9	644.4	883.3
1984	244.5	640.6	885.2
1985	231.3	580.5	811.8

Sources: Government land value estimates for 1946–51, 1952–68, and 1969–85 were obtained from Goldsmith (1962), Milgram (1973), and our updating of Milgram's estimates, repectively, with all estimates converted from current dollars into 1985 dollars by the GNP deflator.

Table 6.14 **Value of Federal Land: Rural, Urban, and Total (billions of 1985 dollars)**

Year	Rural	Urban	Total
1956	20.6	32.7	53.3
1957	19.7	35.6	55.3
1958	19.5	37.8	57.2
1959	22.6	38.4	61.0
1960	25.9	40.5	66.4
1961	30.2	43.4	73.6
1962	31.8	45.6	77.4
1963	33.0	48.6	81.6
1964	35.3	51.4	86.7
1965	37.7	52.4	90.1
1966	39.7	54.5	94.1
1967	42.1	56.0	98.1
1968	43.1	56.3	99.4
1969	50.4	61.7	112.1
1970	47.7	64.0	111.8
1971	44.1	88.4	132.6
1972	50.7	93.4	144.0
1973	55.0	112.6	167.6
1974	61.9	115.7	177.6
1975	54.1	121.5	175.6
1976	62.7	120.0	182.7
1977	73.4	127.2	200.5
1978	83.7	133.1	216.8
1979	83.9	133.7	217.6
1980	73.4	153.1	226.5
1981	76.0	176.7	252.7
1982	56.1	177.2	233.3
1983	60.5	178.4	238.9
1984	58.0	182.4	240.4
1985	49.9	181.4	231.3

Estimated values of state and local government land are found in column 2 of table 6.13. Our 1985 market value is $580.5 billion. As can be seen in figure 6.15, the value of this land grows steadily at a slightly increasing rate between 1968 and 1981. This reflects real increases in average land prices and yearly net acquisitions of 1–2 percent of the stock. Since 1981, the value of state and local land has decreased a total of 18 percent, as a significant decrease in nominal farmland values and a leveling off in urban land values have caused our composite price index to decrease.

6.9 Contingent Liabilities

The federal government and closely allied federally sponsored agencies engage in activities that generate contingent liabilities (and also

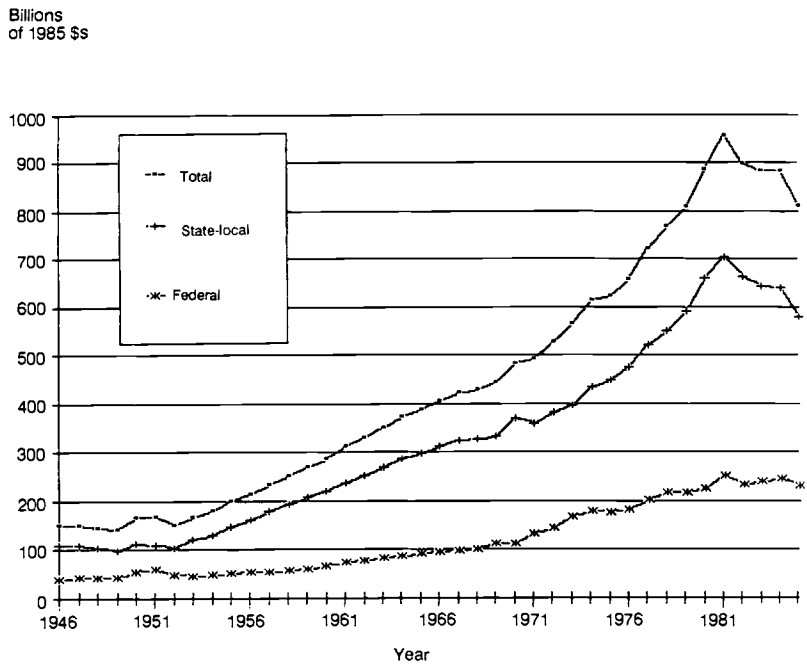

Fig. 6.15 Value of government land

assets) for the government. The most important of these are loans, loan guarantees, and deposit insurance. The recent developments in real estate, agriculture, energy, and less-developed-country loans threaten the solvency of the two major deposit insurance programs—the Federal Deposit Insurance Corporation (FDIC) and the Federal Savings and Loan Insurance Corporation (FSLIC). The agricultural debt crisis has already brought the Farm Credit System, a federally regulated and sponsored financial intermediary, to Congress for emergency financial relief. Agricultural loan guarantees by the Farm Home Administration are in the process of major default and substantial federal payouts. Other federal insurance programs of questionable solvency include the Pension Benefit Guarantee Corporation and social security. We discuss social security in the next section.

The exact nature and extent of these federal liabilities and those of the smaller but often analogous state and local insurance program liabilities are unclear. Various statements have been made that provide estimates of the "maximum" exposure or risk or potential liabilities of the federal government. For example, the federal government publishes annually a document showing total insured deposits. Arthur Anderson and Company (1986) presents estimates of the maximum risk

exposure in notes appended to a government balance sheet. But as documented in Boskin, Barham, et al. (1987), the history of deposit insurance has been primarily one in which the uninsured deposits are insured as well. These amount to 30 percent of all bank deposits. But it is also unlikely that a severe financial crisis would result in such payoffs. It is only imaginable in a state of the world in which the entire economy is in chaos and the government is forced to resort to hyperinflation to pay its debts.

On the other hand, current budgetary treatment of deposit insurance, loans, and guarantees is misleading and inaccurate. There is no sense of accrual accounting, usually only net spending (net of revenues) is reported, there is no separate capital account, and there is no adjustment from par to market value. Still, it is helpful to have some rough idea of the size and nature of these contingent liabilities. Table 6.15 presents postwar time-series data on the total outstanding—at par value—of direct loans, loan guarantees, and federally sponsored enterprise debt. It should be emphasized that the total outstanding figures not only are at par value but also include some double counting as there are secondary guarantees. To avoid the double counting, a rough rule would be that 20 or 25 percent of the total outstanding in the recent years are secondary guarantees.

Each year new commitments amount to a tremendous volume of lending and guaranteeing. For example, in 1986, new commitments of loan guarantees were almost $300 billion. Of this total, the overwhelming bulk were renewing previously extended guarantees that had expired. The total outstanding year-to-year changes reflect the net new commitments. These figures do not include deposit insurance or social security. Of these hundreds of billions in outstanding loans and guarantees, what is a sensible estimate of the contingent liability of the federal government? It is clearly implausible that all the loans will default with probability one, so the total outstanding amounts are a substantial upper bound (although Bartlett 1983 adds them to the regular national debt). While some loans are ultimately forgiven and cost the government the original amount, many are repaid completely. The likely course of future repayments will reflect various factors, including economic conditions such as commodity prices, interest rates, the level of real economic activity, and the like.

It is possible to develop a life-cycle projection of new loan guarantee commitments to determine, on the basis of longitudinal data, the net spending equivalent in present value terms that is likely to occur per dollar of new commitments of loan guarantees and correspondingly for direct loans and agency debt. While in some contingencies the historically based data might prove to be exceedingly inaccurate, it is potentially useful to develop some insight into the historical pattern of

Table 6.15 **Total Outstanding for Direct Loans and Loan Guarantees in Millions of Dollars at Par Value, 1952–86**

Year	Direct Loans, Total Outstanding	Loan Guarantees, Total Outstanding (Gross)	Federally Sponsored Enterprises, Total Outstanding (Gross)[a]
1952	14,020	24,384	2,945
1953	15,656	35,052	3,003
1954	14,740	40,460	3,014
1955	16,088	45,392	3,602
1956	17,116	51,097	4,292
1957	17,503	55,939	5,578
1958	18,454	58,515	5,947
1959	22,458	63,337	7,446
1960	22,579	67,263	9,106
1961	23,932	71,849	9,545
1962	27,264	76,967	11,296
1963	29,459	81,461	11,600
1964	31,326	85,645	13,568
1965	33,054	91,414	15,331
1966	32,997	99,225	19,390
1967	42,208	99,500	19,040
1968	51,799	108,071	22,883
1969	46,856	117,703	26,955
1970	51,078	125,514	37,515
1971	53,156	143,549	38,939
1972	50,149	165,713	43,322
1973	43,891	183,292	54,816
1974	46,132	197,159	71,160
1975	49,777	218,273	84,635
1976	53,404	243,213	90,788
TR	54,220	247,816	93,598
1977	67,637	284,289	101,902
1978	76,526	317,292	129,987
1979	82,972	387,172	163,575
1980	91,663	454,725	195,807
1981	91,287	505,405	231,417
1982	100,220	547,327	275,361
1983	223,000	519,646	261,000
1984	229,300	565,528	314,100
1985	257,400	613,101	369,940
1986	251,600	691,921	453,300

Source: Boskin, Barham, et al. (1987).

[a]The federally sponsored enterprises are the Federal National Mortgage Association, the Federal Home Loan Banks, Federal Land Banks, Federal Home Loan Mortgage Corporation, the Federal Intermediate Credit Banks, Banks for Cooperatives, and the Student Loan Mortgage Association.

actual government spending and support of guarantees and loans. Boskin, Barham, et al. (1987) present an analytic schema and apply it to longitudinal data on cohorts of loan guarantees for government agencies, especially the Small Business Administration, and they estimate that, for each dollar of new commitment, the present value of ultimate spending in support of that commitment is approximately twelve cents. If—and it is a big if—such a figure could be applied to other programs, a rough estimate of the likely value of the ultimate federal government liability based on the value of the loans would be about 12 percent of the figures reported in table 6.15, about $30 billion dollars in support of loans, $80 billion in support of loan guarantees, and perhaps $50 billion in support of federally sponsored enterprises in 1985. There are a variety of reasons to believe that the 12 percent figure may be too low or too high in various circumstances for different kinds of lending activity, but we mention this only because it has become somewhat fashionable either to ignore these contingent liabilities or to report them as the maximum risk exposure or the total value outstanding, as if that figure were readily comparable to, say, the privately held regular national debt. Clearly, that procedure is inappropriate.

Deposit insurance raises similar, though in some ways more subtle and more quantitatively important, issues. First, the nature of the banking deposit insurance system is that the risks are systematically correlated to a much greater extent than in other federal government lending programs. There is a small probability of extremely high payouts. But even defining the maximum exposure of the FDIC or the FSLIC is questionable. The Treasury counts total insured deposits. But that exceeds by a factor of at least fifty the properly measured net worth of the FDIC or the FSLIC. By law, the FDIC and the FSLIC (and several other smaller analogous organizations) have a line of credit at the Treasury, but this line of credit is quite modest. Does the Treasury and/or the Federal Reserve stand behind all insured deposits? All deposits? Or only the amount in the funds plus the standby borrowing authority at the Treasury? Total deposits at insured banks were $1.974 trillion—coincidently, about the size of the privately held national debt—in 1985, whereas the insured amounts were $1.503 trillion. The total assets of the FDIC were $26.4 billion in 1985, and the standby borrowing authority at the Treasury $3 billion.

The FDIC and the FSLIC are technically independent agencies, so they could legally default on their liabilities without giving their creditors a claim on the Treasury. Clearly, the potential liabilities of the FDIC and the FSLIC substantially exceed their assets in bad-case scenarios. What is a sensible expected present value to put forth for such contingent liabilities? Surely, they are substantially less than either the total deposits insured at institutions or the total insured deposits. Formally, we would like to sum the present discounted value of ex-

pected payouts in each period to obtain an appropriate loss reserve as the best single number to provide as a contingent liability. This would depend not only on future economic conditions but also on the interpretation of the various rules, laws, and political decisions concerning backing the thrift industry. Rather than present a time series of estimates, we refer the interested reader to Boskin, Barham, et al. (1987) for analytic discussion and report in the balance sheets presented in section 6.11 alternative estimates of these contingent liabilities of the deposit insurance system.

As noted above, state and local governments also have various contingent obligations, including those to state-chartered banks, unfunded pension liabilities, and so on. We raise these issues here but do not attempt to elaborate the analysis.

6.10 Social Security

Because the social security program looms so large in the financial picture of so many, and because, until recently, it has been more or less a pay-as-you-go system, the currently unfunded liabilities of the social security system at any point in time are usually large, subject to substantial variation depending on assumed patterns of economic and demographic trends, and subject to enormous change with seemingly minor (relative to the intense debate over budget deficits and tax reform) changes in rules relating to benefits or taxes. It is not our purpose here to review the voluminous literature concerning the potential effect of social security "wealth" on real economic activity, such as the saving/consumption choice or retirement decisions.[46]

How to define the expected obligations of the social security system is also a subject of much controversy. Under a closed-group approach, the expected future taxes and benefits paid by particular cohorts—for example, all those currently alive or currently above a certain age, such as eighteen—would be calculated, discounted to the present, and compared. The difference between the expected present value of benefits and taxes would be the surplus or deficit. This concept, using current participants as the group, is adapted by Arthur Anderson and Company (1986). Under an open-group concept, the expected present value of benefits and taxes paid over some time period, often taken to be the seventy-five-year long-term actuarial projection period of the Social Security Administration (SSA), would be compared, with the difference being the deficit or surplus. Thus, taxes paid in the early working years of the currently unborn and benefits paid to persons during retirement who are not yet in the labor force would be counted. While seventy-five years is an extremely long time period, and while modest changes in growth rates or demographic assumptions can make

huge swings in the expected balances in social security, swings the size of the regular national debt, the time frame is somewhat arbitrary, as are the various assumptions involved.

Table 6.16 presents estimates of the long-term actuarial deficit in the retirement and disability part of social security over the next seventy-five years under alternative economic and demographic scenarios (as developed by Boskin and Puffert 1987 and Boskin 1987). The annual amounts are adjusted for inflation and discounted to the present at a real discount rate of 2 percent (the interest rate assumed earned on social security balances by the Social Security Trustees). As can be seen, in the base case, the SSA's intermediate assumptions for economic and demographic trends over the next seventy-five years, there is a deficit of almost $0.5 trillion, slightly under 0.5 percent of taxable payroll over the period. Under the SSA actuary's optimistic assumptions, there is a $3.4 trillion surplus, while, under the overall pessimistic assumptions, there is a $2.6 trillion deficit. Thus, moving all the economic and demographic projections from intermediate to either optimistic or pessimistic results in a change that is larger than the privately held national debt. But all the assumptions do not have to change for there to be an enormous variation in the expected surplus. For example, leaving all the other assumptions aside and just adopting the high wage growth assumptions of the SSA actuaries results in a surplus of almost $900 billion, a $1.4 trillion increase over the base case. Adopting the low mortality assumption, holding all the other demographic assumptions and economic assumptions to those of the intermediate case, results in a deficit of $1.7 trillion, a $1.2 trillion increase.

The numbers revealed in table 6.16 are substantial, and social security looms large in the lives of many Americans—there are 37 million current beneficiaries and over 100 million taxpayers, the majority of

Table 6.16 **OASDI System Finances, Various Economic and Demographic Scenarios, Seventy-five-Year Totals, 1986–2060 (billions of 1986 dollars, discounted to 1986)**

Scenarios	Surplus	Variation of Surplus from Base Case
Base case	−495	0
Overall optimistic for trust fund	3,389	3,884
Overall pessimistic for trust fund	−2,567	−2,072
High wage growth	878	1,373
Low wage growth	−948	−453
High mortality	468	963
Low mortality	−1,700	−1,205
Benefit-ratchet-unfunded	−3,690	−3,195
Pay-as-you-go tax rates	0	495

Source: Boskin and Puffert (1987).

whom pay more in social security taxes than in income taxes. It would be surprising if there were no effects of these variations. However, the seventy-five-year period is somewhat arbitrary. The deficit occurs for a variety of reasons, not the least of which is the passage of the extra large baby boom generation into retirement, followed by the baby bust generation paying high tax rates to finance the benefits of the baby boom. The period beyond the seventy-five-year projections would be one of surplus if the benefits were raised no further and the high tax rates maintained as the ratio of workers to retirees edges upward as the baby bust generation retires.[47]

For a variety of reasons, projections of social security deficits should be taken with a certain degree of caution. Not only are they enormously sensitive to these economic and demographic assumptions, about which reasonable people might disagree, but future social security benefits are also not contractual obligations in the same way as the regularly issued national debt. While the national debt is issued in bonds of nominal dollar value and hence could be altered substantially by unexpected inflation, as emphasized by Eisner (1986), it is unlikely to be repudiated, even in part. Social security benefits and taxes and their difference, on the other hand, are really potential future obligations. They can be changed by congressional action changing the benefit formulae—for example, changing the bend points in the retirement plan as proposed, but rejected, in the early 1980s; taxing all social security benefits, or half of them as was done in 1983; changing marginal tax rates in the income tax, as was done in the Tax Reform Act of 1986; raising the age of eligibility for future social security beneficiaries, as was done in 1983 prospectively for the early twenty-first century, and so on.

Another important issue surrounds the fact that for the first time social security retirement funds are projected to be on a path that deviates systematically from pay-as-you-go finance. Under pay-as-you-go finance, the long-term actuarial deficit in social security is identically zero, as each year's benefits are paid by each year's taxes, although they may not line up so evenly for a particular age group or income group or for families of different marital status. Concern about the long-run deficit really seems to be concern about whether taxes will be raised or benefits reduced when projections create a situation in which the two are likely to diverge systematically. For the old age and survivors insurance system, the real discounted value of the projected surplus peaks around 2020 at almost $800 billion (see fig. 6.16), and several hundred billion dollars would be added by the disability fund. To provide some insight into the possible difference in the social security retirement system's long-run surplus, consider two scenarios: we use the temporary surplus to raise benefits without correspondingly raising taxes later on in the seventy-five-year period, or we revert to pay-as-

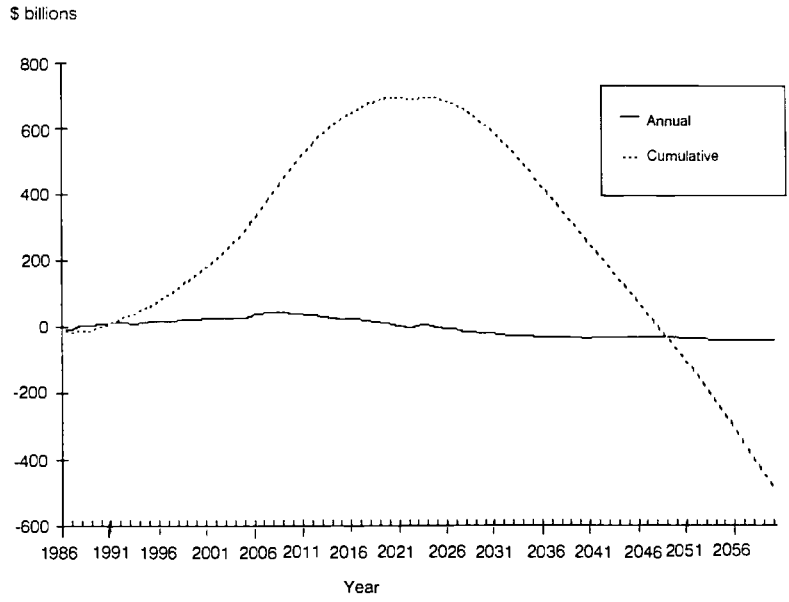

Fig. 6.16 Old age and survivors insurance system projected real discounted surplus for base case, annual and cumulative

you-go finance by lowering tax rates during the period of the surplus. As the final two rows of table 6.16 reveal, the long-run actuarial deficit in the retirement part of the system increases to $3.7 trillion under the benefit-ratcheting-up case but is eliminated under the pay-as-you-go tax-rate-reduction case (in which tax rates are reduced during years of surplus and raised during the years of deficits to restore the pay-as-you-go nature of the system).

The hospital insurance system is projected to be in much worse shape than old age, survivors, and disability insurance (OASDI) (see fig. 6.17) because the tax rate for hospital insurance is fixed at 2.9 percent of taxable payroll while health care expenditures are growing, partly for demographic reasons and partly because of differential growth in health care costs versus general inflation. Even if the latter is brought under control, the demographics will cause the expenditures under the hospital insurance part of medicare to rise, so, when compared with slowly growing tax revenues, the deficit must widen. Thus, over the next several decades the options for social security are accruing a surplus in the retirement and disability funds, dissipating it for other uses such as assigning some of the tax proceeds to medicare, and so on.

For all these reasons we prefer to provide the supplemental information concerning social security as additional potential liabilities in

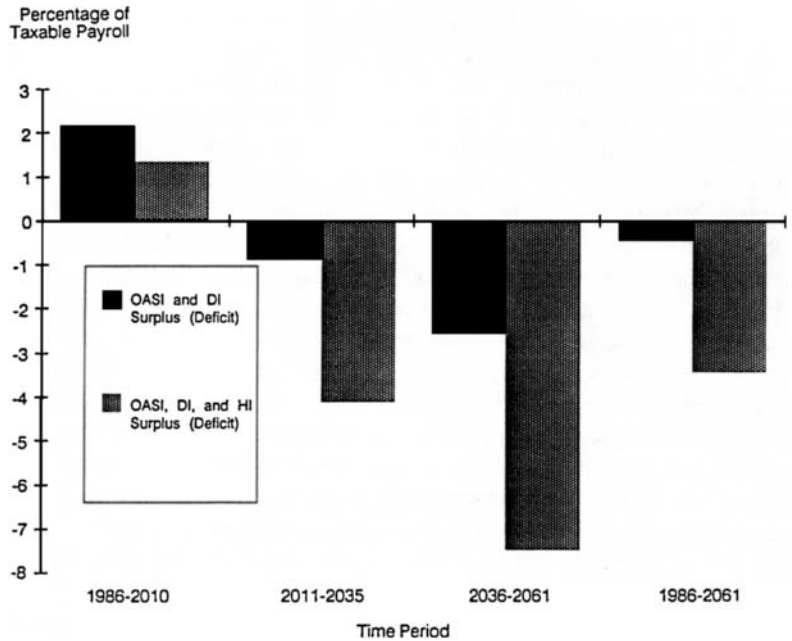

Fig. 6.17 Projected social security finances under intermediate (IIB) assumptions

any balance sheet for the government sector. We do not propose to add it to the regular national debt.[48]

6.11 Government Balance Sheets

With our estimates of government tangible and financial assets and liabilities, the temptation to create government balance sheets is irresistible. Before giving in, however, we must stress numerous caveats and cautions.

While we believe that we have developed improved estimates of tangible assets, each of the major categories of assets and liabilities presents conceptual and measurement difficulties. The "net worth" figures we shall present are, accordingly, subject to substantial error. Moreover, extremely important classes of liabilities—contingent and potential—are excluded, at least above the line, because, unlike financial liabilities or assets, they are mostly not traded on a market or easily quantified with existing data and are subject to large uncertainty. Presenting rough estimates of contingent liabilities on loans, guarantees, and deposit insurance and potential liabilities in unfunded pension programs (especially social security) "below the line" is not meant to

suggest that they are less important than those included above the line. However, they are subject to different degrees of precision, contractual obligation, and conceptual estimation. Also, they are taken from other sources (although some are by Boskin). Of course, governments have enormous intangible assets, including the power to tax, so a negative net worth would not imply bankruptcy or imminent debt repudiation. Accordingly, our calculations, like similar ones by Eisner and Pieper (1984) and Eisner (1986), should probably be viewed as illustrative of trends rather than as accurate point estimates of net worth.

Further, how to add up various components is by no means obvious. Finance theory tells us we should place greater value on future income streams that are negatively correlated with other sources of income. Thus, if one concludes that the value of government mineral rights will rise substantially when oil prices accelerate sharply, and if this is associated with a deep recession or some other long-lived economic event, these revenues may be systematically negatively correlated with other sources of government revenue; and similar issues arise on the outlay side. The conceptually proper thing would be to apply a risk charge to the various components in the various time periods on the basis of subjective probability distributions of outcomes and estimates of the risk tolerance (the reciprocal of the Arrow-Pratt measure of risk aversion) and to discount those charges to the present. We have not sought to do this here, but we do wish to emphasize that the variability of likely future returns or outlays stemming from various government activities is large, as it is for the private sector, and that there may also be systematic covariance among components that should be taken into account in establishing a balance sheet.

Estimates of the real change in net worth have important, but still limited, uses. The net worth provides some indication of future tax liabilities. When oil was discovered in Alaska, expected future tax liabilities of Alaskan residents dropped dramatically.

Changes in net worth indicate what legacy, in the form of future government service net of tax liabilities, current generations are providing future generations. Of course, this does not imply that the only ethical course is to leave net worth unchanged. If future generations will be richer, or if the current generation has made large sacrifices, as, for example, in World War II, it may be entirely appropriate to pass tax burdens forward.

Changes in net worth are not necessarily a good indicator of fiscal tightness. But information on conventional deficits may usefully be supplemented by various adjustments to government assets and liabilities. Eisner and Pieper (1984) and Eisner (1986) provide some evidence that changes in real net debt are a better measure of fiscal policy

than are conventional deficits. Boskin (1988) presents evidence that the private propensity to consume out of the excess of government tangible capital over explicit debt is 0.04, about the same as generally found for private wealth. This suggests that public and private saving are substitutes in the sense that increased government tangible capital increases private consumption and decreases private saving. These studies indicate that the type of data generated in this paper may be of some use in the studies of the effect of fiscal policy on short-run stabilization and/or long-run growth.

Having discussed their usefulness and limitations, we turn to the numbers. In table 6.17, balance sheets for the federal government for 1970, 1980, and 1985 are provided. As throughout this paper, the figures are in 1985 dollars. While real liabilities of the federal government grew by 18 percent between 1970 and 1980, the net debt, owing in part to rising gold prices, fell by 14 percent. Net worth grew by $692 billion, to over $1.0 trillion. While many were bemoaning record deficits, the value of federal assets, especially oil and gas, was growing rapidly. In the 1980s, the picture is very different. Despite large investment in reproducible assets, particularly for the military, the value of federal

Table 6.17 **"Balance Sheet" for Federal Government, Selected Years (billions of 1985 dollars)**

	1970	1980	1985
Tangible assets[a]	1,063.1	1,661.0	1,787.7
Reproducible assets	776.6	941.8	1,064.9
Residential structures	15.8	27.8	29.5
Nonresidential structures	358.7	469.1	443.1
Equipment	247.4	274.8	376.7
Inventories	154.6	170.1	215.5
Land	111.8	226.5	231.3
Mineral rights	174.7	492.7	491.5
Financial assets	619.7	939.5	1,031.1
Currency, demand, and time deposits	46.8	40.8	53.4
Gold	31.9	203.2	86.4
Foreign exchange—special drawing rights	9.0	20.3	32.1
U.S. government securities	206.4	169.2	205.8
Treasury issues	205.8	157.2	194.3
Agency issues	.5	12.0	11.5
Mortgages	86.7	172.4	224.9
Other loans	173.4	262.6	317.7
Taxes receivable	15.2	9.3	10.6
Miscellaneous assets	50.3	61.7	100.2
Total assets	1,682.8	2,600.5	2,818.8

(continued)

Table 6.17 (continued)

	1970	1980	1985
Liabilities			
Treasury currency and special drawing rights certificates	16.0	17.7	18.0
Demand deposits and currency	138.3	158.4	182.4
Bank reserves and vault cash	83.0	61.7	54.1
Credit market instruments	900.2	1,097.3	1,954.2
Treasury issues	654.5	814.8	1,590.1
Agency issues	104.5	193.4	279.4
Savings bonds	141.2	89.2	84.7
Insurance, retirement reserves	92.8	111.4	159.0
Miscellaneous liabilities	58.0	67.5	92.3
Total liabilities	1,288.3	1,514.0	2,460.0
Net debt	668.6	574.5	1,428.9
"Net Worth"	394.5	1,086.5	358.8
Note: Contingent liabilities:[b]			
Loss reserve estimate for loans and guarantees	27.0	90.0	145.0
Deposit insurance	N.A.	30.0	50.0
Potential liabilities (rough est): Unfunded pensions			
Civil service[c]	. . .	575.0	. . .
Military[d]	. . .	525.0	. . .
Social security:			
OASDI[e]	. . .	1,600.0	500.0
Hospital insurance	. . .	2,600.0	2,500.0

Note: N.A. = not available.

[a]Includes real revaluations as discussed in text.

[b]For loans and guarantees, see text. Deposit insurance very rough estimates from Boskin, Barham, et al. (1987) and sources cited therein.

[c]From Leonard (1985).

[d]From Leonard (1987). Estimates are for 1982.

[e]From Boskin (1987) and sources cited therein.

assets increased by about 8 percent (less if 1986 were considered because of falling real oil prices). Meanwhile, federal liabilities reached record levels. The result is that net worth dropped by $727 billion in only five years, unraveling the gains made over the 1970s. Most of this drop occurred after the end of the recession.

State and local government net worth, excluding pension obligations, also grew substantially during the 1970s, as shown in table 6.18. Tangible assets increased by about $1.0 trillion, while net debt fell. Net worth grew by more than 80 percent in real terms. Neither net debt nor tangible assets changed much from 1980 to 1985 so that net worth

Table 6.18 "Balance Sheet" for State and Local Governments, Selected Years (billions of 1985 dollars)

	1970	1980	1985
Tangible assets[a]	1,624.4	2,680.3	2,554.5
Reproducible assets	1,253.9	1,896.0	1,863.2
Residential structures	38.6	57.0	56.0
Nonresidential structures	1,161.6	1,765.3	1,723.1
Equipment	52.2	70.3	80.1
Inventories	1.6	3.4	3.9
Mineral rights	[b]	125.0	110.8
Land	370.5	659.3	580.5
Financial assets	188.0	268.2	466.3
Currency, demand, and time deposits	91.2	92.9	78.0
Security repurchase agreements	.0	18.2	48.8
U.S. government securities	69.4	90.1	231.8
Treasury issues	59.8	54.4	166.3
Agency issues	9.6	35.7	65.5
State and local obligations	6.1	7.8	8.3
Mortgages	11.7	40.3	78.3
Taxes receivable	9.6	18.9	21.1
Total assets	1,812.4	2,948.5	3,020.8
Liabilities			
State and local obligations	368.1	326.0	428.6
Short term	34.9	18.6	18.5
Other	333.2	307.3	464.1
U.S. government loans	12.8	9.9	26.8
Trade debt	17.0	23.6	23.0
Total liabilities	397.9	359.5	523.4
Net debt	209.8	91.2	66.1
"Net Worth"	1,414.5	2,589.0	2,488.4
Note: Unfunded pension liabilities[c]	. . .	543.6	. . .

[a]Includes real revaluations as discussed in text.

[b]State and local mineral rights estimates are calculated only for 1980 and 1985 and because of the data limitations are perhaps less reliable than the other items included. Tangible assets and "net worth" for 1970 are understated because of the absence of a mineral rights estimate. For a discussion of contingent liabilities and unfunded pensions, see text.

[c]From R. Inman (1985). Estimates are for 1980 and include teachers retirement systems only; they are therefore a lower bound.

remained about $2.5 trillion. The net worth of state and local governments is still larger, according to our calculations, than the total financial liabilities of the federal government.

Finally, with the provisos mentioned above, we report estimates from other sources of large contingent and potential liabilities. For example, the estimate of the unfunded liability for the retirement and disability

part of social security is almost $500 billion under the intermediate economic and demographic projections; for hospital insurance, it is over $2 trillion (see Boskin 1987; and Boskin and Puffert 1987). Federal civil service and military retirement systems unfunded liabilities amounted to over $1 trillion for 1980.

6.12 Conclusion

We have presented new, updated, and adjusted estimates of various components of the government's contribution—positive or negative—to national wealth and its growth in the postwar period. We have invoked numerous caveats along the way and have attempted to highlight what we believe are some important points. We have not gone as deeply into some aspects of these issues as some other previous authors in order to go further in other dimensions of the problem. Our primary substantive conclusions are as follows.

1. The share of national output devoted to consumption has risen substantially, while that devoted to net saving has fallen sharply, in the period 1951–85. The private consumption rate has risen about 6 percentage points, from 63 to 69 percent over this period, while the government consumption rate has fallen slightly. The national saving rate has fallen about 4 percentage points.

2. The federal government consumption rate has fallen dramatically, from 13.7 to 8.7 percent from 1950 to 1985. In the same period, the state and local consumption rate has risen from 9.7 to 12.6 percent.

3. The extension of traditional saving and investment measurement to include consumer durables and government tangible investment raises the national saving rate substantially, as do our depreciation estimates. For example, in 1985, the gross and net saving rates rise from a traditionally measured 13.8 and 3.2 percent to 24.5 and 8.8 percent, respectively, about 1.5 percentage points of the increased net saving rate resulting from our lower estimates of depreciation on conventionally defined business capital.

4. The federal government's assets, tangible and financial, are substantial; throughout the 1970s, they grew much more rapidly than the national debt. By 1980, we estimate federal tangible assets, in constant 1985 dollars, at $1.7 trillion and financial assets at $940 billion compared to liabilities of $1.5 trillion.

5. Since about 1980, the "net worth" news is much worse, as conventional liabilities have grown much faster than assets, causing about a $727 billion decline in federal net worth.

6. The state and local government sector also contributes importantly to government and national wealth. The state-and-local-sector fixed

reproducible capital is about twice the federal amount, $1.9 trillion in 1985 versus $1.0 trillion. The difference between assets and liabilities is also greater, as well as more stable, for state and local governments. The estimated "net worth" of state and local governments was about $2.5 trillion in both 1980 and 1985.

7. Total government reproducible capital amounts to a sizable fraction of corresponding private capital. In 1985, the public capital stock was 55 percent of the private nonresidential capital stock.

8. Government net investment has often been sufficient to turn the government sector into a net saver despite large budget deficits; that is, assets were accruing more rapidly than liabilities.

9. It is important, if difficult, to go beyond traditional structures and equipment investment, and capital stocks. Inventories, mineral rights, and land are quantitatively quite important (over $900 billion in 1985 for the federal government alone) and the most volatile components of government saving. Real revaluations of tangible capital, inventories, land, and mineral rights are frequently substantial.

10. Very large contingent and potential liabilities must be considered, although we prefer not to add them directly to the more contractual obligations. Changes in rules governing social security, for example, can produce changes in potential unfunded liabilities almost as large as the regular privately held national debt. Some previous attempts to incorporate contingent liabilities and unfunded pensions have inappropriately focused on either the maximum risk exposure in the former or a closed-group concept of liabilities for the latter.

In establishing the value of various components and aggregate government assets, liabilities, and net worth, the covariance of the likely revenues or outlays associated with the assets and liabilities with other returns and outlays for the government, and, indeed, other components of national income, must be considered. We have not even begun to do so here. Additional considerations concern the government's power to print money and to tax.

We hope that this study, by focusing attention on the role of the government sector in the generation and formation of national wealth, will join a growing list of important studies enabling us to improve the system of accounts used in reporting economic activity in the United States and in analyzing the performance of the economy. Much research remains to be done before some of the thorny issues addressed here are resolved to the extent that such accounts can stand alongside traditional national income accounts on a daily basis,[49] but the evidence from this and other recent studies suggests that failing to do so may seriously distort our notion of the levels and rates of growth of national saving, capital formation, and other dimensions of economic performance.

Notes

1. The theory of local public goods suggests that there may be at least a partial market test for site-specific investments.

2. Various government-sponsored enterprises that are, at least nominally, private also maintain a specific line of credit at the Treasury. Still more subtle is the treatment of mandated private activity. While the economic "rules of the game," establishing property rights and the like, are made by the government, governments in advanced economies have increasingly required the private sector to engage in various activities and provide various types of benefits. For example, when pollution- and safety-control equipment is mandated by law for automobiles, regardless of whether the activity mandated passes social cost-benefit tests, the expenditures are counted as part of gross private auto sales, although they are close substitutes for the government levying a tax and paying the automobile companies to install them. Various recent proposals would require employers to pay for health insurance coverage for all employees. Quite aside from the effects this might have on wages and/or employment, it would be considered in the data as private compensation of employees, not government taxes and spending.

A related issue is what to do about uncompensated or below-market compensation services "purchased" by the government. For example, a military draft presumably enables the government to hire military personnel at below-market wage rates (for estimates of these uncompensated services in the twenty-five years after World War II, see Eisner and Nebhut 1982). This issue is not confined to the government but extends to the private sector as well. For example, substantial uncompensated volunteer time is given by millions of Americans every year to various charitable causes. This often enables the free- or below-market price dispensation of various services, and, hence, the size of this product is underestimated in the national income accounts. We do not propose magic answers to these problems; we only raise difficult questions and applaud those who have sought to assign plausible orders of magnitude to them.

Another important distinction is between consumption and investment expenditures. Again, accounting rules and various conventions in the private sector make even the traditional private-sector data somewhat suspect. In the booming microelectronics and software industries, much of what an economist might think of as investment—a purchase made to enhance future earnings—becomes totally obsolete before the three-year period elapses that distinguishes investment from consumption expenditures.

3. The government spends substantial amounts on education and health—as does the private sector—and other forms of spending that may include a substantial human capital component. How much of this is investment vs. consumption? Various recent studies have attempted to ascertain this human capital component for both the private and the government sector (see Kendrick 1976; and Eisner and Nebhut 1982). Certainly, the expenditures are quite large, and, if all such expenditures are included, gross investment in human capital is about as large as gross investment in tangible capital. But not all the expenditures is investment, and, of course, the stock of such capital depreciates and obsolesces.

4. Musgrave (1980, 1986) and Bureau of Economic Analysis (1982).

5. For more details on the BEA methodologies, see Bureau of Economic Analysis (1982) and Musgrave (1980).

6. A bell-shaped Winfrey S-3 retirement distribution is used to assign service lives ranging from 45 to 155 percent of the mean service life for each category.

7. Hulten and Wykoff (1981) state that "the age-price profiles estimated using the Box-Cox model were very close, on average, to being geometric in form" (p. 93). The eight NIPA asset categories for which depreciation rates were calculated directly as averages of rates for the assets they study were tractors, construction machinery, metalworking machinery, general industrial equipment, trucks, autos, industrial buildings, and commercial buildings.

8. For further discussion of the strengths and weakness of the estimates and the used-asset-price approach, see Hulten and Wykoff (1981), DeLeeuw (1981), Taubman (1981), and Boskin, Robinson, and Roberts (in press).

9. For additional discussion of the theoretical issues, see Boskin, Robinson, and Huber (1987).

10. For further discussion of this point, see Jorgenson (1986) and Jorgenson and Griliches (1972).

11. For some categories, such as military equipment, there are no private analogues and little or no secondary market. Even for government assets comparable to private categories, depreciation may be systematically different, owing, e.g., to differences in maintenance. Any adjustments to depreciation rate would be quite arbitrary, however, without more information.

12. On the basis of studies (e.g., Jack Faucett Associates 1974; and Kendrick 1976) that estimate or assume a shorter service life than the BEA does, we assume a forty-year service life for highways and streets instead of the BEA's sixty-year life.

13. The BEA's 1982 dollar estimates were updated by the price indices used by the BEA to derive its current and constant dollar estimates. These price indices are implicit in the BEA current- and constant-cost net capital stock, investment, and depreciation data, as found in the 1986 BEA wealth data tape. Separate indices are used for each asset type, and values differ slightly for stocks (end of year) and flows (yearly average).

Thus, we converted the constant-cost net capital stock estimates from 1982 to 1985 dollars for each BEA asset category by multiplying the 1982 dollar net capital stock series by the ratio of the 1985 BEA current-cost net capital stock to the BEA constant-cost (1982 dollars) net capital stock. Similarly, we multiplied the corresponding investment and depreciation flows by the ratio of 1985 current-cost depreciation to 1985 constant-cost depreciation (1982 dollars). This reflects the BEA's use of an end-of-the-year price index for stocks and a yearly average price index for investment and depreciation flows.

We attempted to reproduce the BEA estimates from the gross investment and service life data. We exactly succeeded for several categories, but we were slightly off on others. We believe the differences result from our incomplete data on BEA adjustments for intersectoral transfers. To correct for this and other possible statistical discrepancies, we subtracted the excess of our straight-line estimates over the BEA's from our estimates.

14. The different trend is due to the smaller share of equipment in government investment in the postwar years. For further discussion and detailed estimates, see Boskin, Robinson, and Roberts (in press) and Boskin, Robinson, and Huber (1987).

15. Much of the worry about the infrastructure, however, concerns deferred maintenance. As Hulten and Peterson (1984) point out, maintenance is not counted as investment. If governments spend less on maintenance than the private sector does, our depreciation estimates may be too low. Of course, we are also considering the entire state and local sector. The infrastructure may

well be deteriorating in some areas while substantial investment goes on elsewhere.

16. We have scaled the GNP deflator to equal 1.0 at the end of 1985. Eisner's (1980) definition of real net revaluations seems to be identical to ours. However, he deflates slightly differently. We believe our method corresponds more closely to the definition.

17. The data were kindly provided to us by John Musgrave. We are also grateful to Paul Pieper for his assistance. The BEA 1982 constant dollar estimates of federal government military and nonmilitary, and state and local government, inventories were each updated to constant 1985 dollars by multiplying by the ratio of the 1985 BEA current dollar stock to the 1985 constant (1982) dollar stock for each type. Inventory investment was then calculated as the change in net stock from the previous year.

18. This breakdown was provided to us by Paul Pieper on the basis of BEA data.

19. For a review of the literature on valuing the services of consumer durables, see Katz (1983).

20. Hulten and Wykoff applied their rates only through 1974. Recent work by Hulten, Robertson, and Wykoff (1986) suggests that depreciation did not shift substantially after the oil shocks. Hulten and Wykoff did not attempt to find a depreciation rate for residential capital either.

21. The BEA methodology is described in Musgrave (1979). Kendrick (1976) also used double-declining balance for nonvehicle consumer durables. For a discussion of alternative depreciation assumptions for consumer durables, see Katz (1983).

22. Our depreciation estimates for residential and nonresidential structures are significantly lower than the BEA's, while our estimates of the depreciation of consumer durables are much higher.

23. Martin, Landefeld, and Peskin (1982) consider several methods for calculating the value of services of government capital net of depreciation. The current-cost framework values all vintages of capital at current prices and interest rates. This method would be appropriate if we were using a market value of government capital as set, e.g., in a stock market since the market would demand the same rate of return on all capital of similar risk. With our cost-base capital estimates, such a measure would overstate fluctuations as interest rates change.

A second method used by Martin, Landefeld, and Peskin is a vintage framework, under which investment in any year is assumed to meet a cost-benefit test with an interest rate appropriate to the year. They use a five-year average of nominal interest rates as their proxy for the discount rate used at the time of investment. It seems unlikely, however, that investment decisions vary with fluctuations in interest rates, particularly nominal rates. When inflation rates change, using nominal rates means that the real value of services would vary for the existing capital.

We prefer their third method of assuming a constant real rate of return. They use a 7 percent real rate, but we believe that that is probably above the rate of return actually achieved on government capital. Hence, we use a 3 percent real rate. The calculations, particularly of saving rates, are quite insensitive to the constant real rate chosen.

24. While we have alternative estimates based on different combinations of deflators of the various components, the estimates reported here for comparability with the traditional NIPAs are presented as current dollar estimates for

the corresponding period. The corresponding constant dollar figures are similar but show a smaller rise in private consumption and fall in government consumption.

25. The methodology is described in an appendix to Eisner (1986). Eisner and Pieper build on work by Seater (1981) and Cox and Hirschhorn (1983).

26. The large interest subsidies received by state and municipal bondholders and some borrowers from federal agencies might suggest further refinements of these adjustments if one were willing to contemplate sales of portfolios to the private sector that continued to carry tax advantages.

27. We are grateful to Paul Pieper for providing us with 1985 par-to-market indices.

28. While revising and updating the data, we discovered a programming error underlying table 1 of Boskin et al. (1985). We correct the series in table 6.12. Fortunately, the qualitative conclusions of Boskin et al. (1985) are unaffected by the error, but the revised estimates are about one-third lower.

29. We shall argue below, however, that severance taxes on the production should also be counted as royalties.

30. For a more complete description and discussion of the method, see Boskin et al. (1985). The following persons provided unpublished data or other assistance with this section: L. Cordova of the Minerals Management Service, D. Everitts and H. Gonzalez of the California State Lands Commission, S. Sharlot of the Texas General Land Office, B. Van Dyke of the Alaska Division of Oil and Gas, and C. Logsdon of the Alaska Department of Revenue.

31. Without this assumption, one needs to know the rates of leasing, discovery, and production of the resources. For a justification, see Boskin et al. (1985). We consider alternative assumptions, as did Boskin et al. (1985), below.

32. Since the government receives royalty revenue only on oil actually produced, it seems appropriate for a wealth calculation to use the best estimate of oil reserves rather than have reserves fluctuate with changing geologic predictions. Reserve estimates should change, though, as prices and technology change. Given the assumption of rising real prices, however, oil that is not profitable to produce at current prices will probably become profitable in the future. Even using a reserve estimate made with high real prices—Boskin et al. (1985) use 1981 figures—will probably understate ultimate recovery of oil and gas.

33. Implicitly, this assumes that oil and gas markets are in equilibrium each year.

34. If prices grow more slowly than the interest rate by 1 or 2 percent, and if we assume that 10 percent of proven reserves are produced and 3 percent of undiscovered reserves are proven each year, then the value in 1981 would fall to $494 or $383 billion, respectively.

35. Production figures are from U.S. Department of Energy (1986a). Except for Alaska, most oil and gas on state land is underwater. Louisiana is the only significant omission.

36. The figure for Alaska is based on a phone conversation with the state Department of Revenue (the figure quoted was 99.75 percent). The California and Texas percentages are based on mimeo sheets on "tide and submerged lands" with the Texas figure inferred from royalties, royalty rates, and an assumed price. No information was available on other state-owned land in either state.

37. Alaska changed from using a formula based on fraction of investment and employment in the state to one based on sales when the oil pipeline was completed. Percentage is calculated using figures in State of Alaska (1986).

38. Actually, the figure is even greater since Alaskan revenue increases more than proportionally with the world oil price and Boskin et al. (1985) assume rising oil prices. In part, this is due to the high transportation cost of Alaskan oil. The state is currently forecasting revenues of $1.70 per barrel for fiscal 1987, a drop of 63 percent from the 1985 figure with only a 44 percent drop in the world oil price. This makes calculating the value of oil and gas rights over time even more difficult.

39. Without a gas pipeline, the value of Alaska's gas is problematic.

40. Royalty rates are based on the average of royalty rates on Relinquishment Act lands and State Fee lands weighted by the acreage in each category under lease. Severance tax rates were provided by the U.S. Advisory Commission on Intergovernmental Relations.

41. Reserve figures are from U.S. Department of Energy (1986b). Production on state land is calculated using royalties, royalty rates, and a $26 per barrel price for oil and a $2.60 per thousand cubic feet price for gas.

42. Undiscovered reserve estimates were taken, as usual, from U.S. Geological Survey (1981). Texas figures are approximate since the regions the Geological Survey used were not contiguous with state boundaries.

43. For a discussion of previous estimates of government land values and another version of estimates for the federal government, see Boskin et al. (1985). The following persons provided unpublished data or other assistance with this section: Z. Addison of the Federal Housing Administration, R. Gary of the National Forest Service, B. Daniels of the General Services Administration, J. Jones of the U.S. Department of Agriculture, and W. Sischel.

44. Although there is a clear upward trend in urban acreage from 1.4 million acres in 1968 to 3.7 million acres in 1985, the observations for three years are outliers; i.e., there is a change in the time series of more than 20 percent that is reversed in the following year. These aberrations are due to temporary reclassifications of land between the urban and the rural categories, twice in the Department of the Navy and once in the Interior Department. We have replaced the irregular values for the agencies in these instances with the average of the previous and following years' values.

45. The uncertain nature of government land value estimates is illustrated by using the same price and acreage data in the slightly different formulas used by Milgram (1973). The differences in methodology arise in the treatment of land that has been newly acquired or reclassified as urban or rural. Milgram uses the change in the GSA acquisition cost series to measure total net land acquisitions instead of relying on the GSA acreage series and price data. In contrast to our procedure, Milgram's estimate of total federal land value does not increase when government land is reclassified from rural to urban since the original acquisition cost is unchanged. There is an increase in the value of urban land that is exactly offset by a decrease in the value of rural land. These differences cause Milgram's method to generate much lower estimates of federal land values. The 1985 value for Milgram's method is $133 billion. We prefer our method since reclassification of land from rural to urban as cities expand reflects genuine increases in the value of land. However, the large difference in estimates derived from somewhat different methods suggests that further research remains a high priority.

46. The interested reader might consult Hurd and Boskin (1984), Diamond and Hausman (1984), Feldstein (1974), Barro (1974), and Boskin, Kotlikoff, et al. (1987).

47. However, it will not return to the current ratio as gains in life expectancy result in a permanent increase in the aged dependency ratio.

48. In addition to the social security system's accrued liabilities, the federal government has substantial other accrued pension liabilities as well. These include military, veteran, and civilian retirement and disability compensation plans. Various studies have been done analogous to those on social security, attempting to estimate these liabilities. The pension funds of current military employees and the civil service pension system, while probably subject to revision in years ahead, represent some substantial degree of contractual obligation of the federal government. They amount to well over $1 trillion among them. The unfunded pension liabilities of state and local governments have been, at times, substantial. Again, similar caveats to those mentioned above apply.

49. Attempts to measure either private or government saving, investment, or consumption and, correspondingly, private and government capital should use depreciation methods consistent in treatment of relative vintages of the capital stock, i.e., depreciation methods consistent between formation of the capital stock series and the imputed rental flow series. This is not true of the NIPAs' depreciation or of the depreciation methods and estimates used in most studies of growth accounting. Two recent, important exceptions are Jorgenson, Gollop, and Fraumeni (1987) and the Bureau of Labor Statistics (1983). While it is not our purpose to evaluate the importance of these distinctions in growth accounting, some studies (see Jorgenson 1986) suggest that these differences can be enormously important in partitioning the sources of growth. For our purposes, it is clear that the depreciation series, and therefore the net investment and capital stock series, differ substantially, primarily because of differences in the treatment of structures, relative to NIPA and the BEA capital stock series.

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Comment

Robert Eisner

Boskin, Robinson, and Huber are pioneers in what I hope is a growing band who would enlighten our perceptions of the economy as a whole by bringing the government sector into the mainstream of accounting for saving, capital formation, and wealth. They here offer a number of significant contributions. Among those striking me as most noteworthy are their estimates of the value and fluctuations in the value of government-owned natural resources and their improved estimates of the value of land. I warmly endorse as well their sober and measured view of "contingent liabilities" and of the nature of the government's social security obligations. They have also added helpfully to corrections of naive and simplistic views of the nature of government deficits (and surpluses).

Substantial as are their contributions, it behooves the discussant to suggest things that they also should have done but did not do and things that they might have done differently. Most conspicuous is the exclusion of human capital. After all, a prime role of government is to facilitate the development and preservation of human capital. Government contributes mightily to investments in education, health, and research. The government contribution to capital formation can hardly be measured meaningfully when these are excluded.

A second major exclusion relates to net revaluations or capital gains. If full accounting is not made for the revaluation of government assets and liabilities, the links between saving and capital formation and between income and wealth are lost. As the authors do acknowledge, meaningful discussions of government budget deficits and balance sheets and their effect on the economy cannot take place without recognition of the role of revaluations. They do not, however, endeavor to reconcile the flows of "deficit" and "saving" with balance sheet items for net debt, net worth, and total capital.

Some measure of the importance of government contribution to human capital formation may be found in my estimates (Eisner 1985,

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1989) that in 1981 the government product going to capital accumulation came to $314.9 billion, of which only $26.7 billion was in natural resource accumulation; the rest was in education and training, health, and research and development. This compared to a total of only $344.5 billion for all business fixed investment (excluding owner-occupied nonfarm dwellings). Boskin, Robinson, and Huber do well to add net government investment in tangible assets to the government surplus (perennially a deficit) to get a better measure of government saving, still generally found, at the federal level at least, to be negative. But their measure is very far from being a meaningful indicator of the government contribution to national capital formation. Boskin, Robinson, and Huber are not warranted in labeling the change in government net worth as they measure it, the "legacy in government service net of tax to future generations." They are all the less justified in referring to their measure of gross saving as "government's contribution to national wealth."

I do have some further problems with the authors' measure of fixed reproducible capital, which stems from their depreciation procedures. They take Hulten-Wykoff estimates of declining balance depreciation rates as a percentage of straight line for equipment and for structures and apply these generally to Bureau of Economic Analysis (BEA) estimated service lives for the various types of government capital.

The data used by Hulten and Wykoff (1981) relate to sale prices of used private assets. However ingenious, their approach strikes me as suspect. Assets that are sold may be expected to be worth less to sellers than comparable assets that they retain. Specificity of purpose and function are likely to make them still less valuable to purchasers. And the "lemon principle" is likely to lower further what buyers are willing to pay. The fact that Hulten and Wykoff found a geometric decline in sales price by age of asset hardly confirms that a geometric decline correctly describes the loss of value of assets in place.

The argument of Christensen and Jorgenson (1973) and Jorgenson and Griliches (1972), resurrected by Boskins, Robinson, and Huber, that geometric depreciation is theoretically neater or "consistent" because a geometric decline in efficiency or flow of capital services would then (with constant rates of discount) correspond to geometric declines in value, is not evidence that depreciation is in fact geometric. As Denison (1972) pointed out, the combination of declines in efficiency, obsolescence, and discount rates may well (and probably do) make straight line a reasonable approximation to economic depreciation (see also Eisner 1973). Given straight-line depreciation, it is clearly possible to impute service flows as the sum of depreciation and the return on capital consistent with the rates of discount implicit in the calculation of depreciation.

The effect of Boskin, Robinson, and Huber's depreciation assumption is a somewhat faster depreciation and hence lesser capital stock in government equipment than estimates such as those of Eisner (1986) taken from BEA straight-line-depreciation net stocks but a considerably slower depreciation and hence much larger estimates of net stocks of structures. Which estimates are most appropriate is still another matter because the true lives and rates of obsolescence and decline in efficiency remain critical.

A final caveat relates to Boskin, Robinson, and Huber's measure of government consumption. They define this as total government expenditures for goods and services minus government investment in tangible assets plus the imputed services of government tangible capital. They then offer measures of the total of private and "public" consumption as indicators of the extent to which we are consuming now at the expense of the future. But much of government spending relates essentially to intermediate product or "regrettables" such as defense, police, and transportation, which contribute to final product, if they do, of investment as well as consumption. And Boskin, Robinson, and Huber's government "consumption" very considerably involves services that go to the production of human and other intangible capital that are rather of the nature of investment than consumption.

In similar vein, Boskin, Robinson, and Huber's definition of net government saving tells us little about government—let alone national—capital formation. For government borrowing from the private sector may in fact be used to finance, directly or indirectly, private capital formation. And government borrowing from abroad cannot properly be viewed as a charge against domestic saving without a full accounting for capital gains and losses from both exchange rate changes and other factors. Huge recent declines in the value of the U.S. dollar, for example, generated gains in the dollar value of U.S. holdings abroad that largely counterbalanced our deficits on current account.

The financial deficit of the government, conventionally viewed as public dissaving and still taken by Boskins, Robinson, and Huber as a component of government saving, may actually contribute to capital formation, as noted in Eisner (1986). The deficit, particularly when measured as the increase in real debt of government, generally stimulates more private consumption *and* investment.[1] There is in fact "crowding in" of investment rather than "crowding out." And the current account deficit and capital account surplus with the rest of the world do not, given changes in exchange rates as well as prices, necessarily reflect any decline in our national net worth. It might be well, therefore, to pay less attention to Boskin, Robinson, and Huber's measure of net government saving and more to net government capital formation and, ultimately, to net national capital formation, broadly defined.

Note

1. That proper concerns with regard to government debt must relate largely to its effect on private agents in the economy is a prime reason why I am skeptical as to the usefulness of Boskin, Robinson, and Huber's recommendation, not implemented in their current paper, that the value of state and local debt be reduced to reflect its tax-exempt status. The worth of that debt to its holders is its market value. Further, as the authors acknowledge, it is not clear that state and local governments can and do invest the bulk of the proceeds of their borrowing in assets with a return in excess of their borrowing costs or that whatever arbitrage they can engage in is not already reflected in their balance sheets.

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