# Executive Summary

*He has erected a multitude of New Offices, and sent hither swarms of
Officers to harass our people, and eat out their substance.*
-The Declaration of Independence

In recent days there has been much concern among policy makers about America's declining saving rate. And while the discussion has centered around the possible causes, implications, and solutions to this decline, as the chart below demonstrates, there can be no doubt about the reality and significance of this decline:

- Between 1947 and 1994, private savings averaged 12.9 percent of aftertax income.

- Today, it is considerably below that at 7 percent.
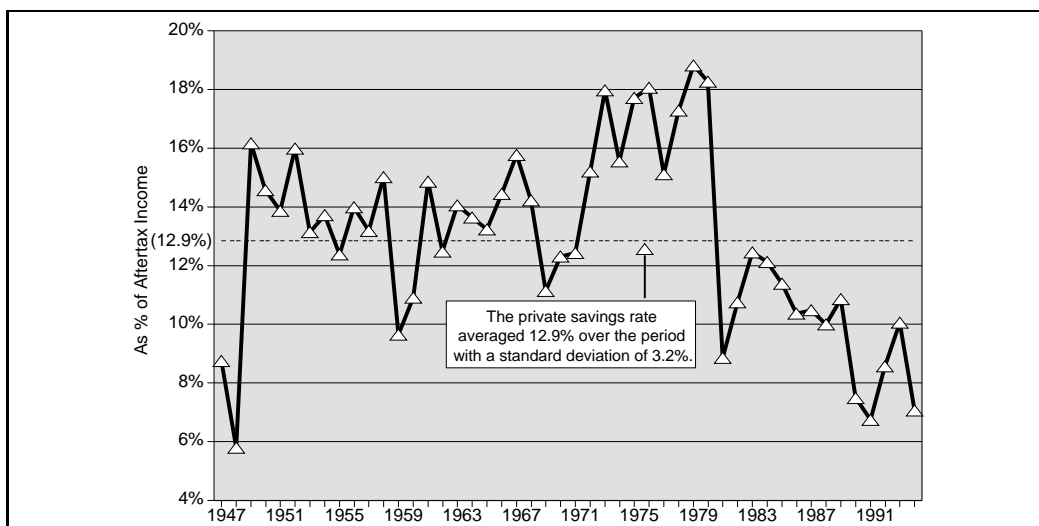
Net Private Saving Rate

This paper demonstrates that there is a significant historical relationship between the private saving rate and the tax treatment of capital, as demonstrated by the chart below.

- Specifically, a 10 percent increase in the aftertax rate of return to capital will result in between a 7 to 11 percent increase in saving.

These findings have significant implications for the current tax reform debate. It is clear that *in order to stimulate economic growth by increasing private savings, America's tax policy must be changed to remove the penalties on saving and investment.*
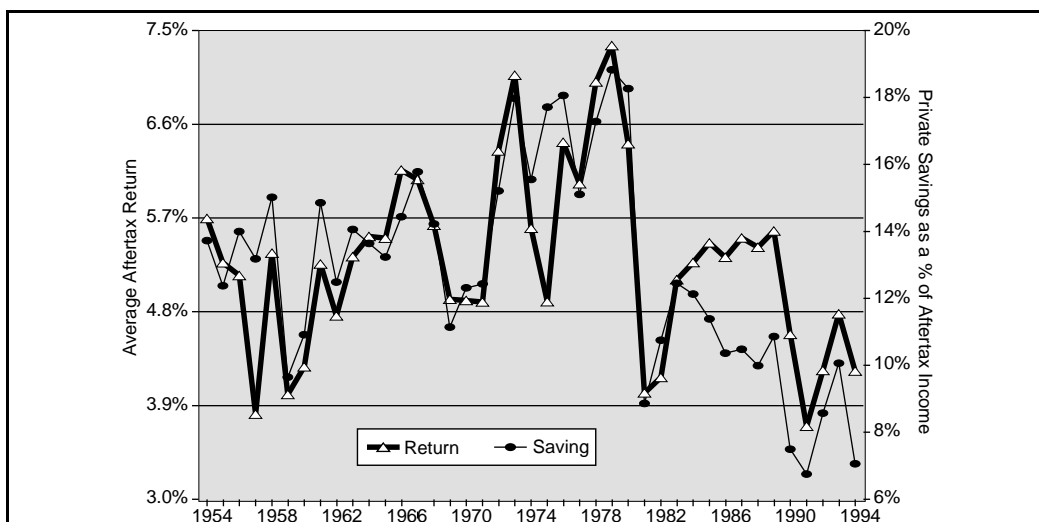
**Private Saving Rate and
the Average Aftertax
Return to Capital**

EATING OUT OUR SUBSTANCE:
How Taxation Affects Saving

Introduction

Another major debate about reforming the U.S. tax system has begun. Motivating that debate are two main concerns. The first is that the income tax is not fair, and the second is that since the U.S. does not save enough, the tax system needs to be changed to remove the existing bias against saving and investment.

Tax reform efforts are nothing new, arising roughly once a decade. The last major debate occurred in the mid-1980s and resulted in the Tax Reform Act of 1986. Reforms that claim "fairness" as a goal are not new, either. Fairness in the twentieth century, correctly or not, has come to mean that the rich—read business and upper income people—should be subject to higher tax rates. Because upper income people tend to save and invest more, taxing the rich has inevitably meant taxing capital.

What is new this time is the policy focus on saving. Until the mid 1970s, conventional wisdom held that the saving rate is virtually constant. Because economists and policy makers believed that raising or lowering tax rates would not affect saving, considerations of tax effects on saving and investment were generally absent from policy deliberations.

But the 1970s also witnessed a new economic phenomenon—stagflation. The simultaneous occurrence of high inflation and unemployment caused a re-examination of conventional wisdom. One new school of thought, which became known as supply-side economics, posited that taxation did affect the economy. Specifically, lower tax rates on the next dollar of income from work, saving or investment would encourage those activities. More labor and capital would lead to higher economic growth. Conversely, higher tax rates on productive activities would dampen growth.

Theory needs testing, however. In 1978, Michael Boskin, who later served as chairman of the Council of Economic Advisors for President Bush, published results showing that higher capital taxes would lead to less saving and lower taxes would lead to more saving.[1] His findings, however, have gone largely unheeded in the policy-making community.

Debate over whether taxation affects the economy continues. Last November's election, which gave Republicans control of the House of Representatives for the first time in four decades, also brought attention to *dynamic scoring.*[2] New Congressional leaders argued for an overhaul of existing government forecasting methods. Specifically, they wanted to see economic effects of policy changes become part of the estimating process.

This change has met, not unexpectedly, with great resistance from the official forecasting community and its supporters. Although there is some talk of change, the Joint Committee on Taxation and the Congressional Budget Office continue to operate much as before.[3] That is, government revenue estimators assume that total economic activity remains the same whether taxes are raised, lowered or left unchanged.

Paradoxically, those opposing tax cuts have used Boskin's results to argue that a cut in capital gains taxes would have little effect on the economy. However, even this represents a shift, albeit a small one, in position. Little effect is still bigger than no effect. The argument now centers on the size of this effect.

This report is the first in a series aimed at providing information about important issues in this current tax reform debate. Initial reports will focus on how saving, investment, taxation and growth relate to one another. If taxation does affect saving and investment, changes in policy will affect total economic activity. Because these economic changes will affect the tax base, existing revenue estimation methods will have to be changed to be of use in policy deliberations. Later reports will analyze economic, revenue and other effects of specific tax reform proposals using the evidence developed in the initial studies.

The purpose of this report is to show that there is a strong historical relationship between private savings and its aftertax return. Specifically, the study updates and extends the research done by Boskin in 1978. The next section discusses the Boskin findings. Because the return to saving is such a key component of the analysis, the third section constructs the measures that are used in this study. The fourth section presents the updated results while the fifth discusses their implications and limitations.

The purpose of this report is to show that there is a strong historical relationship between private savings and its aftertax return.

The Boskin Findings

The main impetus behind the 1978 study by Michael Boskin was to confront conventional wisdom among many economists and policy makers that the *return* on saving has no bearing on how much our economy saves. Boskin noted:

> The notion that saving is perfectly interest inelastic has received widespread acceptance among empirical and policy-oriented macroeconomists. While I shall present considerable evidence that nothing could be further from the truth, it is worthwhile exploring just how important the interest elasticity of the saving rate is in the analysis of a wide variety of vital issues of economic policy. In so doing, I hope to point out how costly it has been (and will continue to be) to accept the conjecture—based on evidence which is flimsy at best and dangerously misleading at worst—that the interest elasticity of the saving rate is negligible.[4]

Interest elasticity, an economist's term, here refers to the responsiveness of saving to its return.[5] If the interest elasticity were zero, or close to it, increases or decreases in the return to saving would not affect saving behavior. If saving were interest elastic, however, increases (decreases) in the return would cause increases (decreases) in saving.

If saving is sensitive to its return, tax decreases would lead to more saving.

The reason interest elasticity is so important to economic policy is that taxation affects the return to saving. Specifically, increases in taxes on income from saving such as interest, dividends and capital gains decrease the return to saving. If saving is sensitive to its return, tax increases would lead to less saving. Conversely, tax decreases would lead to more saving.

It is ironic that Boskin's results are now often used by those who want to downplay the effect of taxation on saving. How did this paradox come about? The probable explanation lies in the size of Boskin's estimates. Using U.S. data from 1929 to 1969, Boskin found that the elasticity of saving with respect to its aftertax return ranged between 0.2 and 0.6. He believed that an estimate of 0.4 was the best on statistical grounds.[6] This result implies that a 10 percent increase in the return to saving would cause a 4 percent increase in saving.

Because this elasticity appears to be small, some mistakenly jump to the conclusion that the resulting change in saving from an increase or decrease in taxes would also be small. However, Boskin pointed out that an elasticity of 0.4 has dramatic growth implications. He noted:

> In reducing the real net rate of return, current tax treatment significantly retards capital accumulation. This, in turn, causes an enormous waste of resources and redistributes a substantial fraction of gross income from labor to capital. Rough estimates of the lost welfare exceed $50 billion per year (a present value close to $1 trillion) . . .[7]

The rest of this report examines our update of the Boskin results. We find that including data since 1970 supports a much larger response of saving to its aftertax return.

Measuring Saving and Its Return

Key to any analysis of taxation and saving is how saving and its return are measured. This section explains the measures we have constructed for this study and what Dr. Boskin used. Appendix A contains a technical description of our measures along with their values for 1987. Historical values from 1947 to 1994 of the various data series used in our analysis are available at the Institute for Policy Innovation's Internet World Wide WebSite [http://www.metronet.com/ipi/index.html].

The Return to Saving (Capital)

One common approach mistakenly uses the interest rate as the return to saving. However, interest rates represent only one type of return. The return to another form of saving—common stock—bears little relation to that on government bonds.[8] Stocks return almost twice as much as government bonds and exhibit almost three times as much risk or variation.[9] Returns from other forms of saving such as real estate would show still other patterns. [See Figure 1.]

Moreover, these various measures of returns share other flaws. For example, they reflect different sensitivities to actions of the Federal Reserve. Interest rates on bonds include investor expectations of future inflation. Specifically, interest rates go up when investors believe that inflation is around the corner. Because the return

Figure 1

Nominal Return to Stocks and Bonds

Sources: Ibbotson Assoc., and Federal Reserve Bank of St. Louis.
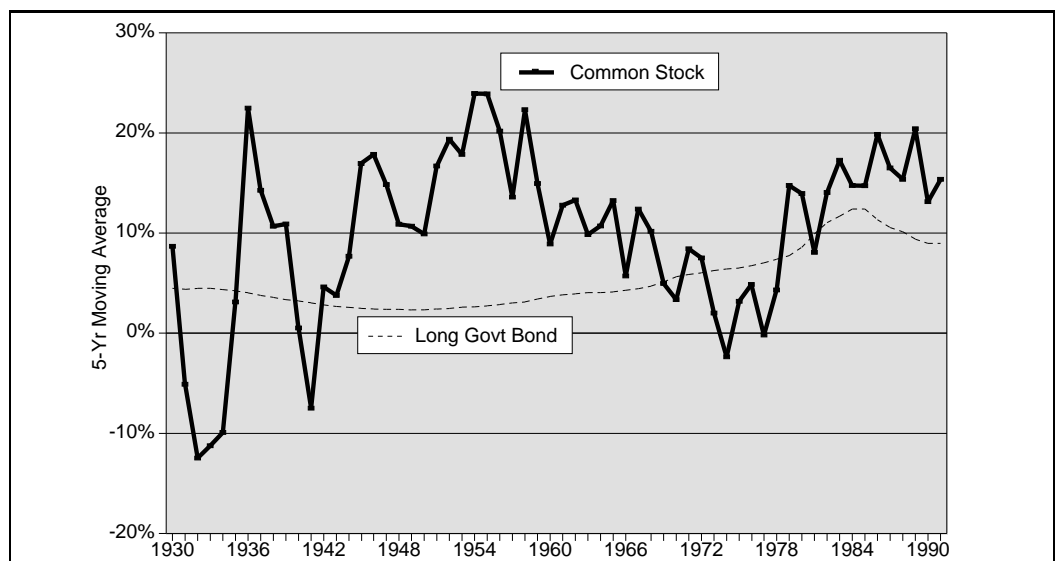
to equity is derived from the sale of *real* goods and services, equities are generally considered hedges against inflation.[10] Measuring the return to saving, therefore, requires neutralizing the effects of inflation, which proves very difficult.

What is the appropriate measure of the return to saving? Saving earns a return only if it is invested. Whether savings are deposited in bank accounts, money market funds, mutual funds or any of a myriad of other instruments, the funds ultimately are used to buy equipment, plant or some other form of productive capital.[11] Some income earned by that capital is used to pay a return to the savers. For example, banks use money that people deposit in savings accounts to make loans to businesses to expand. Businesses pay banks interest on those loans from their increased sales, and the bank uses that interest to pay a return to its depositors.

The return to saving, therefore, is really a **return to capital**. The question now becomes how to measure this return. Boskin used an average aftertax return to capital developed by Professors Dale Jorgenson and Lyle Christensen.[12] Their measure, which comes out of a complete and consistent accounting system for the private sector of the U.S. economy, reflects the total compensation going to capital less replacement, revaluation and taxes. We measure the aftertax return to capital in a similar way.[13] Described below are the two major components of this return: (1) the net aftertax income to capital and (2) the total value of the U.S. stock of capital.

Net Aftertax Income to Capital

Total income to capital is paid out of revenues from the sale of goods and services that capital helps produce. In simplest terms, it is the value of output produced less labor compensation.[14] The value of output includes not only what is produced by the business sector but the income that goes to people as owners of their own homes.[15]

As mentioned previously, inflation must be isolated when measuring the return to capital. There are several ways this can be done. The method used to construct the original Boskin data involves calculating an elaborate system of price and quantity indexes for goods and services and the components of income.[16]

A less elaborate, but just as effective, method relies on the Commerce Department's quantity measures of consumption and investment goods produced and sold. Income and other financial flows such as taxes are expressed relative to a common yardstick, which economists call a *numeraire*. For example, suppose the numeraire is a loaf of bread which cost 20 cents in 1947 and $1 in 1987. To express

> *The return to saving is really a* **return to capital***.*

Total Income to Capital	**1,146.9**	
Private Business		1,143.1
Owner-Occupied Housing		273.8
Less Depreciation	**269.2**	
Private Business		238.3
Owner-Occupied Housing		30.9
Equals Net Capital Income	**1147.7**	
Private Business		904.8
Owner-Occupied Housing		242.9
Less Taxes on Capital Income	**386.7**	
Private Business		335.9
Owner-Occupied Housing		50.9
Equals Net Aftertax Capital Income	**761.0**	
Private Business		568.9
Owner-Occupied Housing		192.0

Table 1

Income to Capital after Depreciation and Taxes, 1987 (Amounts in billions of $1987 of private output)

See Table 6.2 in Appendix A for detail. The *numeraire* is the Commerce Department's implicit deflator for private output which is the nominal spending on private output divided the quantity of private output.

the real value of any financial flow, we simply would divide the dollar amount of the flow by the price of bread in any year. The financial flow would now be expressed in real terms, that is, how many loaves of bread it would buy. For example, it would take a fivefold increase in income between 1947 and 1987 to purchase the same amount of bread. Then, real income in 1947 and 1987 would be the same.

The numeraire we have chosen for this analysis is a composite good called private output.[17] We estimate real income to capital totaled $1.4 trillion in 1987.[18] Of that, $1.1 trillion went to private business capital and $274 billion to homeowners. [See Table 1.]

Two deductions must come out of capital income before a return can be paid to savers/investors. The first deduction is for *depreciation*.[19] Over time equipment and structures wear out or become obsolete and must be replaced to maintain the same productive capacity. Furthermore, as aging reduces the remaining productive life of an asset, its value also declines. To keep the existing stock of capital whole, it is necessary for owners to set aside depreciation (replacement plus revaluation) before taking a return. In 1987, depreciation amounted to $269 billion.

The second deduction from capital income is for taxes. Taxes on capital include corporate income taxes, property taxes and personal income taxes on dividends, interest, rent and capital gains. In 1987, federal, state and local taxes on capital income amounted to $387 billion. Of that, $223 billion were paid by business while $164 billion were paid by individuals. [See Table 2.]

Net aftertax income to capital is the income to capital less depreciation and taxes. In 1987, net aftertax income to capital equaled $761 billion, a little over half the total income to capital. Of that, $569 billion was earned on private business capital while $192 billion went to owner-occupied housing. [See Figure 2.]

Table 2

Taxes on Income from Capital, 1987 ($billions)

See Table 2.1 in Appendix A for detail.

Capital Taxes Paid by Businesses	**223.2**	
Corporate Profits Tax		109.3
Indirect Business Taxes		113.9
Capital Taxes Paid by Individuals	**163.5**	
Income Taxes on Capital Income		106.9
Property Taxes		53.6
Estate and Gift Taxes		10.6
Tax Subsidy to Home Ownership		-7.5
Total Taxes on Capital Income	**386.7**	

Figure 2

Net Capital Income, 1987
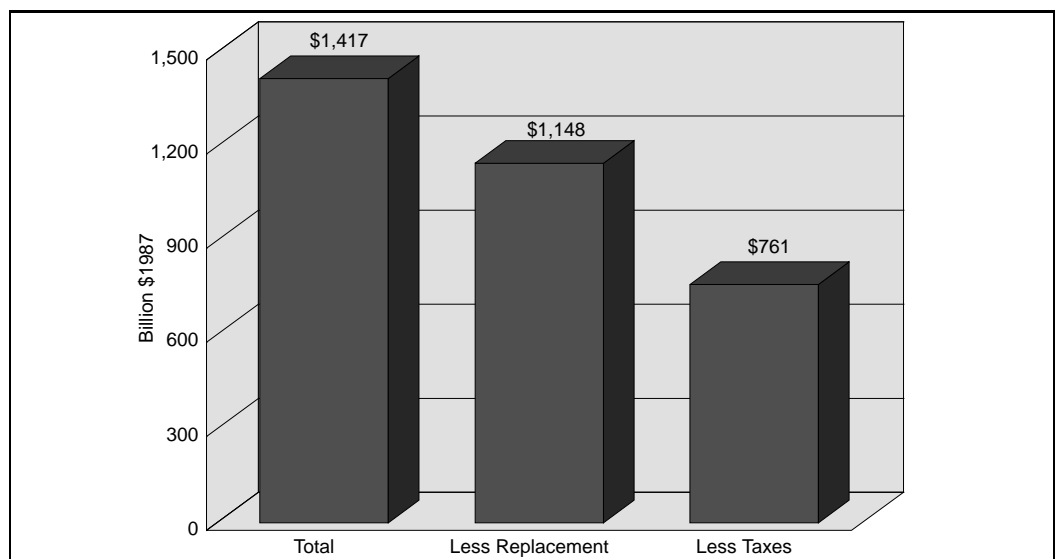
The Stock of U.S. Capital

To translate net aftertax income to capital into a rate of return requires a measure of the capital base. Because we are interested in the rate of return to U.S. capital, the appropriate denominator is the entire stock of U.S. capital.

Four major components make up the capital stock: equipment, structures, inventories and land. Equipment refers to capital that generally remains in service less than ten years, like computers, vehicles or stamping machines. Structures refer to longer-lived assets such as apartment buildings or electric power plants. Because of tax and other differences, structures often are further subdivided into residential and nonresidential. Inventories represent unsold goods. Although land might seem to be fixed, its value can change. For example, the conversion of farms to residential or commercial property increases the total value of land. Accurately measuring the stock capital over time requires taking this shift in use into account.[20]

The stock of U.S. capital amounted to $13.8 trillion in 1987.[21] Land accounted for one-third of the total and residential structures for another third. Next in importance came nonresidential structures (15.7 percent), equipment (11.1 percent) and inventories (6.7 percent). [See Table 3.]

Four major components make up the capital stock: equipment, structures, inventories and land.

			% of Total Stock
Equipment	**1,536.5**		**11.1%**
Corporate		1,067.8	
Noncorporate		468.7	
Nonresidential Structures	**2,166.5**		**15.7%**
Corporate		1,468.5	
Noncorporate		697.9	
Residential Structures	**4,554.0**		**33.0%**
Corporate		65.4	
Noncorporate		539.7	
Owner-Occupied Housing		3,948.9	
Inventories	**931.7**		**6.7%**
Corporate		808.5	
Noncorporate		123.2	
Land	**4,624.8**		**33.5%**
Corporate		947.5	
Noncorporate		1,390.1	
Owner-Occupied Housing		2,287.2	
Business Capital	**7,577.3**		**54.9%**
Corporate		4,357.7	
Noncorporate		3,219.6	
Homeowner Housing Stock	**6,236.0**		**45.1%**
Total Capital Stock	**13,813.4**		**100.0%**

Table 3

Stock of U.S. Capital by Type and Sector, 1987
(billions of $1987)

See Table 4.3 in Appendix A for detail.

The Average Aftertax Rate of Return to Capital

As just mentioned, the average aftertax rate of return to capital is net aftertax income to capital divided by the stock of U.S. capital. Between 1947 and 1994, the economy-wide, aftertax rate of return to capital averaged 5.4 percent. For example, a saver/investor that owned $10,000 in capital could expect to receive an annual return of $540 after depreciation and taxes. Today's aftertax return to capital (4.2%) is more than 25 percent below the historical average. [See Table 4 and Figure 3.]

Table 4

Net Average Aftertax Return to Capital, 1947-1994
(billions of $1987)

| Year	Income[1]	Capital[2]	Return[3]	Year	Income	Capital	Return
1947	203.7	3,447.3	5.91%	1971	381.1	7,791.3	4.89%
1948	177.1	3,531.4	5.02%	1972	516.9	8,149.5	6.34%
1949	245.2	3,671.9	6.68%	1973	608.2	8,604.0	7.07%
1950	243.5	3,863.6	6.30%	1974	502.2	8,963.8	5.60%
1951	235.9	4,031.0	5.85%	1975	452.5	9,244.7	4.89%
1952	266.9	4,192.9	6.36%	1976	619.8	9,644.8	6.43%
1953	231.4	4,324.1	6.35%	1977	605.7	10,047.4	6.03%
1954	253.6	4,454.7	5.69%	1978	740.9	10,577.5	7.00%
1955	243.3	4,615.8	5.27%	1979	821.3	11,168.0	7.35%
1956	247.4	4,804.5	5.15%	1980	748.1	11,665.2	6.41%
1957	189.4	4,962.5	3.82%	1981	476.9	11,862.9	4.02%
1958	274.8	5,122.9	5.36%	1982	502.2	12,046.5	4.17%
1959	210.0	5,240.5	4.01%	1983	628.7	12,307.7	5.11%
1960	230.2	5,388.7	4.27%	1984	668.6	12,679.0	5.27%
1961	293.3	5,577.3	5.26%	1985	712.8	13,048.9	5.46%
1962	273.1	5,737.1	4.76%	1986	713.3	13,397.2	5.32%
1963	316.7	5,944.7	5.33%	1987	761.0	13,813.4	5.51%
1964	339.1	6,138.8	5.52%	1988	769.3	14,200.0	5.42%
1965	349.7	6,350.8	5.51%	1989	815.0	14,620.0	5.57%
1966	406.7	6,601.8	6.16%	1990	680.0	14,845.3	4.58%
1967	415.9	6,852.6	6.07%	1991	552.5	14,926.6	3.70%
1968	400.7	7,116.0	5.63%	1992	639.2	15,087.8	4.24%
1969	362.0	7,361.9	4.92%	1993	735.8	15,394.3	4.78%
1970	371.8	7,575.5	4.91%	1994	663.5	15,690.2	4.23%

[1] Income to capital after replacement and taxes. See Table 6.3 in Appendix A for detail.

[2] Total stock of U.S. capital. See Table 4.3 in Appendix A for detail.

[3] Average net aftertax rate of return to U.S. capital computed as net income divided by the stock of capital.

Figure 3

Net Average Aftertax Return to Capital
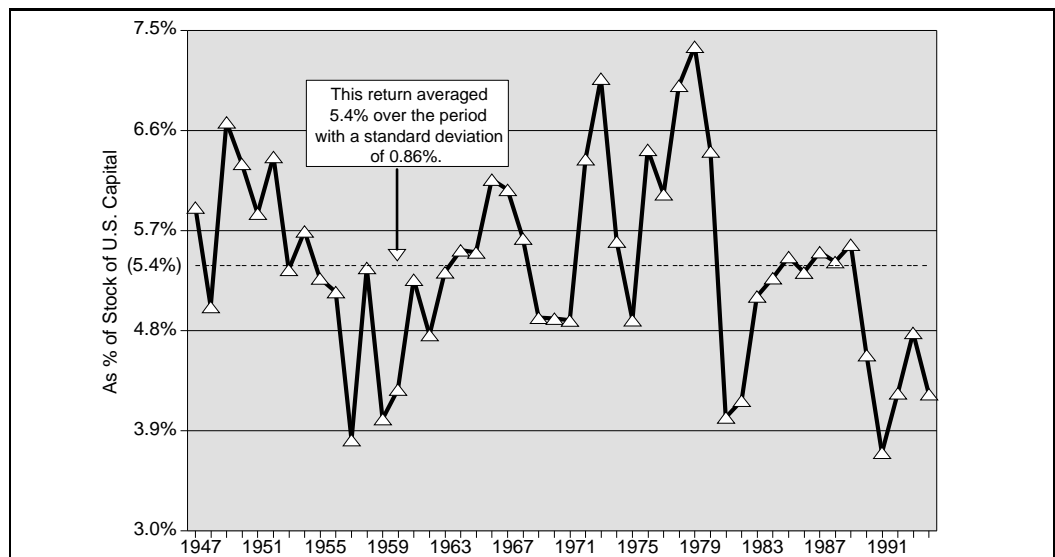
Net Private Gross Domestic Product	4,760.8	
Labor Compensation		2,922.0
Capital Income[1]		1,050.1
Net Change in Value of Land		167.3
Transfer Payments to Persons		521.4
Net Interest Paid to Persons and Business		70.1
Net Private Income from Rest of World		29.9
Less Private Spending for Nonsaving	4,387.9	
Personal Consumption Expenditures		3,185.9
Taxes Paid		1,189.9
Transfer Payments to Rest of World (est.)		6.2
Dividends Paid to Government		5.9
Equals Net Private Savings	372.9	
Personal Consumption	3,185.9	
Plus Net Private Savings	372.9	
Equals Aftertax Income	3,558.8	

Table 5

Net Private Consumption, Savings and Income, 1987 ($billions)

See Table 5.7 in Appendix A for detail.

[1]Net of depreciation.

Private Saving

The other key measure in this study is the rate of private saving. Broadly speaking, income is consumption plus savings. Private savings is the change in net worth of the private sector. The change in net worth consists of new investment less replacement plus revaluation of prior investments. This means that land, one of the largest sources of wealth, must be added to the Commerce Department's measures of saving and income.

To construct a measure of private saving we start with a measure of total private income. Private income primarily is the compensation households receive for their labor services and the returns they earn as savers/investors. In 1987, Americans earned almost $4.7 trillion in income. Almost $3 trillion came as labor compensation while another $1 trillion was capital income. [See Table 5.] Most of that income went for consumption and taxes rather than savings. Personal consumption amounted to $3.2 trillion while federal, state and local taxes claimed another $1.2 trillion. That left $373 billion for net private savings in 1987.

The Rate of Private Saving

To translate private saving into a rate requires a base. We use aftertax income because it represents the resources that the private sector has available to allocate between consumption and saving. Between 1947 and 1994, private saving averaged 12.9 percent of aftertax income. Today it is considerably below that at only 7 percent. [See Table 6 and Figure 4.]
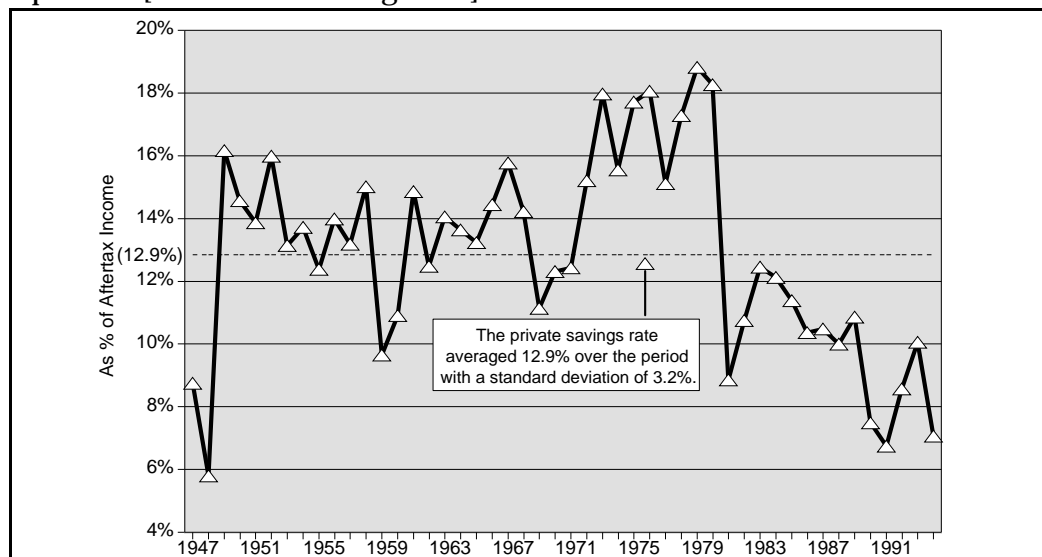
**Figure 4**

Net Private Saving Rate

The private savings rate averaged 12.9% over the period with a standard deviation of 3.2%.

Table 6

Rate of Private Saving,
1947-1994
(billions of $1987)

Year	Private Consumption	Private Saving	Aftertax Income	Saving Rate	Year	Private Consumption	Private Saving	Aftertax Income	Saving Rate
1947	778.6	74.6	853.2	8.74%	1971	1,884.5	267.5	2,152.0	12.43%
1948	790.9	48.7	839.5	5.80%	1972	2,007.2	360.0	2,367.2	15.21%
1949	811.3	156.4	967.7	16.16%	1973	2,093.6	458.7	2,552.3	17.97%
1950	869.9	148.4	1,018.2	14.57%	1974	2,082.3	383.5	2,465.8	15.55%
1951	889.3	143.2	1,032.5	13.87%	1975	2,097.5	451.4	2,548.9	17.71%
1952	923.0	175.6	1,098.7	15.98%	1976	2,215.5	488.2	2,703.6	18.06%
1953	972.0	147.1	1,119.2	13.15%	1977	2,338.1	416.2	2,754.3	15.11%
1954	994.8	158.2	1,153.0	13.72%	1978	2,432.8	508.3	2,941.1	17.28%
1955	1,053.3	148.8	1,202.1	12.38%	1979	2,490.9	577.7	3,068.6	18.83%
1956	1,075.2	174.9	1,250.1	13.99%	1980	2,503.9	559.4	3,063.3	18.26%
1957	1,098.7	166.9	1,265.6	13.19%	1981	2,529.3	245.7	2,775.0	8.85%
1958	1,116.0	197.2	1,313.2	15.02%	1982	2,549.3	307.1	2,856.4	10.75%
1959	1,162.3	124.1	1,286.4	9.65%	1983	2,663.2	378.6	3,041.8	12.45%
1960	1,198.2	146.7	1,344.9	10.91%	1984	2,807.9	387.4	3,195.3	12.12%
1961	1,230.4	214.6	1,445.1	14.85%	1985	2,936.4	377.3	3,313.6	11.38%
1962	1,285.1	183.3	1,468.4	12.49%	1986	3,060.1	353.6	3,413.8	10.36%
1963	1,336.1	218.5	1,554.6	14.06%	1987	3,185.9	372.9	3,558.8	10.48%
1964	1,424.6	225.0	1,649.6	13.64%	1988	3,312.7	367.7	3,680.4	9.99%
1965	1,500.5	228.8	1,729.3	13.23%	1989	3,359.0	409.2	3,768.2	10.86%
1966	1,582.1	267.0	1,849.2	14.44%	1990	3,442.1	278.6	3,720.8	7.49%
1967	1,625.5	304.4	1,929.9	15.77%	1991	3,424.9	247.8	3,672.8	6.75%
1968	1,704.0	282.5	1,986.5	14.22%	1992	3,529.5	330.6	3,860.1	8.56%
1969	1,770.7	221.9	1,992.6	11.14%	1993	3,647.4	407.8	4,055.2	10.06%
1970	1,824.0	256.1	2,080.2	12.31%	1994	3,783.3	287.4	4,070.7	7.06%

The Relationship between Saving and Its Return

Having developed measures of private saving and the real average, aftertax return to capital, we now examine the relationship between the two. Even without econometric analysis, a simple graph shows that the average rate of private saving and its return have moved together over the last four decades. [See Figure 5.]

Figure 5

Private Saving Rate and the Average Aftertax Return to Capital
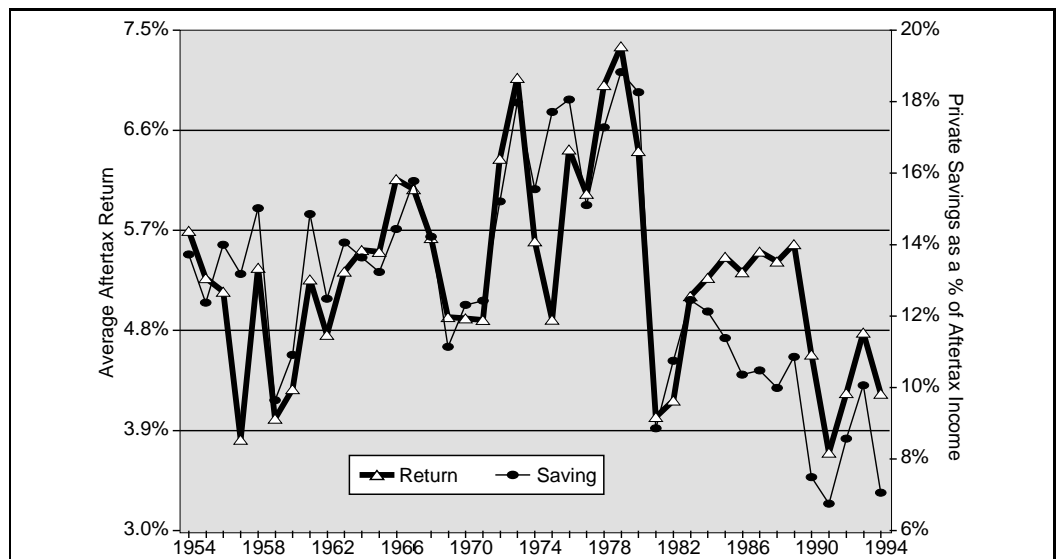
As should be expected, the econometric results confirm this close relationship. Following Boskin, we estimated two equations in which changes in consumption were explained by changes in:[22]

- Aftertax personal income;
- Domestic net worth;
- Average aftertax return to capital; and
- Civilian unemployment rate.

The only difference between the two equations is that in the first all variables except the aftertax return were translated into logarithms while in the second everything was in logs. We estimated each equation using two statistical techniques. One was with a single equation least squares method and the other was with instrumental variables.[23] [Appendix B contains the regression results.]

Because consumption is the opposite of saving, whatever is not consumed is saved. Therefore, the coefficient on the aftertax return in the consumption equation can easily be translated into a saving elasticity. [See Appendix C for a discussion of how the elasticity of saving is calculated from the regression results.]

The elasticity of saving with respect to the aftertax rate of return to capital measures the percent change in saving that will result from a percent change in the aftertax return. For example, an elasticity of 0.3 means that a 10 percent increase (decrease) in the aftertax return will lead to a 3 percent increase (decrease) in saving. Results from the new regression estimates show that: [See Table 7.]

- Updating the regressions to cover the period 1949 to 1994 produces elasticity estimates that are 2.5 times higher than the original Boskin estimates.

- Specifically, a 10 percent increase in the aftertax rate of return to capital will result in between a 7 to 11 percent increase in saving.

- Likewise, a 10 percent decrease in the aftertax rate of return to capital will result in between a 7 to 11 percent decrease in saving.

Specifically, a 10 percent increase in the aftertax rate of return to capital will result in between a 7 to 11 percent increase in saving.

Equation	Boskin[1]	Update[2]
Aftertax Rate of Return		
Least Squares	0.3	0.9
Instrumental Variables	0.4	1.1
Loglinear Aftertax Rate of Return		
Least Squares	0.3	0.7
Instrumental Variables	0.4	1.0

Table 7

Comparison of Estimates of the Elasticity of Saving with Respect to the Average Aftertax Rate of Return to Capital

[1]Michael J. Boskin, "Taxation, Saving and the Rate of Interest," *Journal of Political Economy,* Vol. 86, No. 2, Part 2, April 1978, Table 3.

[2]The elasticity was evaluated for the year 1987.

There are several reasons why our estimates of saving elasticity are higher than Boskin's. For one, the Commerce Department has revised and improved its data estimation methods since the Boskin study. Another is that taxes consume a much larger share of the economy during our sample period (1949-94) than they did for much of Boskin's (1929-69). It is easier for statistical methods to pick up this larger influence of taxes on aftertax capital income and, therefore, saving. Still another is that Boskin had to exclude 1941 to 1946 when the war mobilization effort distorted much of the economy, making the statistical estimation more complex.

While our elasticity estimates are considerably higher than those found by Boskin in 1978, the general pattern is similar to his. Our findings strengthen his conclusion that there is a strong historical relationship between saving and its return.

Implications and Limitations of the Results

These results imply that the static methods currently used by the legislative and executive branches are fundamentally flawed and will serve as erroneous guideposts in the policy-making process.

What implications do these results have for tax policy and the tax reform debate? This analysis has established an historical relationship between total private savings and the average aftertax return to capital. If the government surplus or deficit is held constant, this means that reducing the tax penalties on saving will lead to more saving. In other words, reducing taxes on saving increases the aftertax return to capital which, in turn, increases the amount of savings that the private sector is willing to undertake. Conversely, increasing tax penalties on saving will result in a lower amount of private savings.

As discussed earlier, static revenue estimation assumes that tax policy has no effect on overall economic activity. Evidence that taxes on saving do affect the amount of savings that will occur nullifies this basic premise. In other words, these results imply that the static methods currently used by the legislative and executive branches are fundamentally flawed and will serve as erroneous guideposts in the policy-making process.

These results on saving and its return have important limitations, however. First, they do not establish a link between the return to capital and investment. It may be that the average aftertax return used by Boskin and this study is inappropriate, although related to the relevant return for investment decisions. The next study, which takes up this question, will show how assessing the effect of taxes on investment requires developing information about the expected return to *new* investment.

Second, these results say nothing about the link between saving and investment. Missing is the role played by other components of saving, specifically government surpluses or deficits and net foreign investment. Once these links are complete, the subject of the third study, it is possible to estimate how changes in tax policy will affect total economic activity. In other words, by relating taxes to investment and economic activity, static revenue estimates can be transformed into *dynamic* ones.

Conclusion

Saving and the average, economy-wide aftertax return to capital are highly related. Experience of the last 45 years shows that a 10 percent increase in the aftertax return will produce a similar increase in saving. The reverse is true for a decrease in aftertax return.

While these results have substantial limitations, they do underscore the validity of the conclusion Dr. Boskin made over two decades ago:

> Taken as a whole, the results reported here substantially strengthen the case for reforming the tax treatment of income from capital in the United States, for example integration of the corporate and personal income taxes or, better yet, switching from income to consumption taxation.[24]

Appendix A: Derivation of Measures of Private Saving and the Aftertax Return to Capital

This appendix contains a series of tables that document the development of the saving and return measures used in this report. The first tables start with the components of gross domestic product (GDP) from the Commerce Department's National Income and Product Accounts (NIPA). The tables listed below progress through measures of taxes, labor and capital income, saving and investment, the stock of capital and domestic wealth.

The data in all the tables are for 1987. An historical series from 1947 to 1994 for all the data is available at the Institute for Policy Innovation's Internet World Wide WebSite [http://www.metronet.com/ipi/index.html].

The first column in each table contains a table number (x.x) and line number (:x). For example, tables numbered 1.1 through 1.4 deal with GDP. The entry 1.1:1 refers to table 1.1, line 1. The second column describes the entry and the third gives its 1987 value.

The last column in each table describes either the basic data source or how the entry is calculated. In the former, a source such as NIPA is cited. The latter refers to our tables and line numbers. For example, the entry, "Taxes on Business" in Table 2.1, line 6 is calculated as "2.1:7+2.1:13," or the sum of Table 2.1, line 7 and Table 2.1, line 13. Table footnotes provide any special information or references.

TABLES

GDP Series:

1.1:1	Gross domestic product	4,539.9	1.1:2 + 1.1:3 + 1.1:8 + 1.1:9
1.1:2	Personal consumption expenditures	3,052.2	NIPA 1.1:2
1.1:3	Gross private domestic investment	749.3	Sum of 1.1:4 through 1.1:7
1.1:4	Nonresidential structures	171.3	NIPA 1.1:9
1.1:5	Producers' durable equipment	326.5	NIPA 1.1:10
1.1:6	Residential structures	225.2	NIPA 1.1:11
1.1:7	Change in business inventories	26.3	NIPA 1.1:12
1.1:8	Net exports of goods and services	-143.1	NIPA 1.1:15
1.1:9	Government purchases	881.5	NIPA 1.1:18

Table 1.1

Gross Domestic Product ($billions)

Notes: Designation x..x:x refers to table and line numbers within this set of tables. NIPA x.x:x refers to table and line numbers in the National Income and Product Accounts provided by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce in the *Survey of Current Business* and other publications of historical compilations of those series. The data in all tables is for 1987.

1.2:1	Gross domestic product	4,539.9	1.2:2 + 1.2:3 + 1.2:8 + 1.2:9
1.2:2	Personal consumption expenditures	3,052.2	NIPA 1.2:2
1.2:3	Gross private domestic investment	749.3	Sum of 1.2:4 through 1.2:7
1.2:4	Nonresidential structures	171.3	NIPA 1.2:9
1.2:5	Producers' durable equipment	326.5	NIPA 1.2:10
1.2:6	Residential structures	225.2	NIPA 1.2:11
1.2:7	Change in business inventories	26.3	NIPA 1.2:12
1.2:8	Net exports of goods and services	-143.1	NIPA 1.2:15
1.2:9	Government purchases	881.5	NIPA 1.2:18

Table 1.2

Gross Domestic Product in Constant Dollars (billions of $1987)

Table 1.3

Gross Domestic Product by Sector ($billions)

1.3:1	Gross domestic product	4,539.9	1.1:1
1.3:2	Business (Commerce definition)	3,890.7	1.3:1 - 1.3:16 - 1.3:17
1.3:3	Gross housing product	373.3	NIPA 8.9:7
1.3:4	Nonfarm housing	368.9	NIPA 8.9:8
1.3:5	Owner-occupied	269.6	NIPA 8.9:9
1.3:6	Tenant-occupied	99.3	NIPA 8.9:10
1.3:7	Farm housing	4.4	NIPA 8.9:11
1.3:8	Owner-occupied	4.0	NIPA 8.18:97
1.3:9	Tenant-occupied	0.4	1.3:7 - 1.3:8
1.3:10	Government enterprises inc. Fed.	91.2	Sum of 1.3:11 through 1.3:13 minus 1.3:17
1.3:11	Government	534.3	NIPA 6.1C:18
1.3:12	Federal Reserve banks	17.7	NIPA 3.2:7
1.3:13	Current surplus of government enterprises	17.9	1.3:14 + 1.3:15
1.3:14	Federal	2.7	NIPA 3.2:29
1.3:15	State and local	15.2	NIPA 3.3:24
1.3:16	Households and institutions	170.5	NIPA 1.7:8
1.3:17	General government	478.7	NIPA 1.7:11
	Restated		
1.3:18	Gross domestic product	4,539.9	1.3:1
1.3:19	Private business	3,525.9	1.3:18 less sum of 1.3:20 through 1.3:22
1.3:20	Owner-occupied housing output	273.6	1.3:5 + 1.3:8
1.3:21	Households and institutions	170.5	1.3:16
1.3:22	Government and government enterprises	569.9	1.3:17

Table 1.4

Gross Domestic Product by Sector in Constant Dollars (billions of $1987)

1.4:1	Gross domestic product	4,539.9	1.2:1
1.4:2	Business (Commerce definition)	3,890.7	1.4:1 - 1.4:11 - 1.4:12
1.4:3	Gross housing product	373.3	NIPA 8.10:7
1.4:4	Nonfarm housing	368.9	NIPA 8.10:8
1.4:5	Owner-occupied	269.6	NIPA 8.10:9
1.4:6	Tenant-occupied	99.3	NIPA 8.10:10
1.4:7	Farm housing	4.4	NIPA 8.10:11
1.4:8	Owner-occupied	4.0	1.4:7 times 1.3:8 over 1.3:7
1.4:9	Tenant-occupied	0.4	1.4:7 minus 1.4:8
1.4:10	Government enterprises inc. Fed.	91.2	1.3:10 times 1.4:12 over 1.3:17
1.4:11	Households and institutions	170.5	NIPA 1.8:8
1.4:12	General government	478.7	NIPA 1.8:11
	Restated		
1.4:13	Gross domestic product	4,539.9	1.4:1
1.4:14	Private business	3,525.9	1.4:13 less sum of 1.4:15 through 1.4:17
1.4:15	Owner-occupied housing output	273.6	1.4:5 + 1.4:8
1.4:16	Households and institutions	170.5	1.4:11
1.4:17	Government and government enterprises	569.9	1.4:12

Government and Foreign Sector Series:

2.1:1	Government revenue	1,422.9	
2.1:2	Taxes on output	197.4	Sum of 2.1:3 through 2.1:5
2.1:3	Sales taxes	149.8	NIPA 3.3:8
2.1:4	Excise taxes	32.1	NIPA 3.2:10
2.1:5	Customs duties	15.5	NIPA 3.2:11
2.1:6	Taxes on businesses	276.8	2.1:7 + 2.1:13
2.1:7	Other indirect business taxes	167.5	2.1:8 + 2.1:9 - 2.1:2
2.1:8	Federal ibt accruals	58.4	NIPA 3.2:9
2.1:9	State and local ibt accruals	306.5	NIPA 3.3:7
2.1:10	Property taxes	121.1	NIPA 3.3:9
2.1:11	*On owner-occupied housing*	53.6	NIPA 8.18:91
2.1:12	*Other property taxes*	67.5	2.1:10 - 2.1:11
2.1:13	Corporate profits tax accruals	109.3	2.1:14 + 2.1:15
2.1:14	Federal	85.4	NIPA 3.2:8
2.1:15	State and local	23.9	NIPA 3.3:6
2.1:16	Taxes on persons	913.1	2.1:17 + 2.1:33
2.1:17	Personal tax and nontax receipts	512.4	2.1:18 + 2.1:19
2.1:18	Federal	400.6	NIPA 3.2:2
2.1:19	State and local	111.8	NIPA 3.3:2
2.1:20	Income taxes	478.5	2.1:21 + 2.1:22
2.1:21	Federal	392.5	NIPA 3.2:3
2.1:22	State and local	86	NIPA 3.3:3
2.1:23	*On labor income*	379.2	Fiscal Associates Tax Model
2.1:24	*On Capital income*	106.9	Fiscal Associates Tax Model
2.1:25	*Tax subsidy to home ownership*	-7.5	Fiscal Associates Tax Model
2.1:26	Estate and gift taxes	10.6	2.1:27 + 2.1:28
2.1:27	Federal	7.2	NIPA 3.2:4
2.1:28	State and local	3.4	NIPA 3.4:11
2.1:29	Nontaxes	12.8	2.1:30 + 2.1:31
2.1:30	Federal	0.9	NIPA 3.2:5
2.1:31	State and local	11.9	NIPA 3.3:4
2.1:32	Other	10.5	2.1:17 - 2.1:20 - 2.1:26 - 2.1:29
2.1:33	Contributions for social insurance	400.7	2.1:34 + 2.1:35
2.1:34	Federal	351.5	NIPA 3.2:13
2.1:35	State and local	49.2	NIPA 3.3:11
2.1:36	Surpluses of gov. enterprises inc. Fed	35.6	Sum of 2.1:37 through 2.1:39
2.1:37	Federal surpluses	2.7	1.3:14
2.1:38	State and local surpluses	15.2	1.3:15
2.1:39	Fed. Res. banks corporate tax rebates	17.7	1.3:12

Table 2.1

Government Receipts
($billions)

Notes: The Federal Reserve corporate tax rebate has been moved to the surplus category to be consistent with our prior classification. Personal income taxes have been split based on the level of wages and salaries in adjusted gross income (AGI). The imputation for the value of the home-owner subsidy is calculated as the tax value of property tax deductions at average personal tax rates.

Table 2.2
Government Expenditures
($billions)

2.2:1	Government spending	1,534.8	2.2:2 + 2.2:7 + 2.2:12 - 2.2:17 + 2.2:18
2.2:2	Purchases	881.5	2.2:3 + 2.2:4
2.2:3	Federal	384.9	NIPA 3.2:15
2.2:4	State and local	496.6	NIPA 3.3:14
2.2:5	Labor compensation	478.7	1.3:17
2.2:6	Goods	402.8	2.2:2 - 2.2:5
2.2:7	Transfer payments (net)	531.8	2.2:8 + 2.2:11
2.2:8	To persons	521.4	2.2:9 + 2.2:10
2.2:9	Federal	401.8	NIPA 3.2:19
2.2:10	State and local	119.6	NIPA 3.3:17
2.2:11	To rest of the world (net)	10.4	NIPA 3.2:20
2.2:12	Net interest paid	95.4	2.2:13 + 2.2:14
2.2:13	Federal	136.6	NIPA 3.2:22
2.2:14	State and local	-41.2	NIPA 3.3:18
2.2:15	To persons and business	70.1	2.2:12 - 2.2:16
2.2:16	To rest of the world (net)	25.3	NIPA 3.2:25
2.2:17	Less: Dividends received by government	5.9	NIPA 3.3:21
2.2:18	Subsidies	32	2.2:19 + 2.2:20
2.2:19	Federal	31.7	NIPA 3.2:28
2.2:20	State and local	0.3	NIPA 3.3:23
2.2:21	Housing	11.4	NIPA 8.9:16
2.2:22	To owner-occupied housing	0.2	NIPA 8.18:92
2.2:23	Other housing subsidies	11.2	2.2:21 - 2.2:22
2.2:24	Other subsidies	20.6	2.2:18 - 2.2:21
2.2:25	Surplus or deficit	-111.9	2.1:1 - 2.2:1

Table 2.3
Foreign Transactions
($billions)

2.3:1	Net exports	-143.1	1.1:8
2.3:2	Net receipts of factor income	4.6	2.3:3 - 2.3:4
2.3:3	Receipts of factor income	105.1	NIPA 4.1:7
2.3:4	Payments of factor income	100.5	NIPA 4.1:15
2.3:5	Capital grants received by the U.S. (net)	0	NIPA 4.1:8
	Equals		
2.3:6	Transfer payments (net)	16.6	2.3:7 + 2.3:10
2.3:7	From persons and businesses (net)	6.2	2.3:8 + 2.3:9
2.3:8	From persons (net)	3	NIPA 4.1:17
2.3:9	From business	3.2	NIPA 4.1:19
2.3:10	From government (net)	10.4	2.2:11
2.3:11	Net foreign investment	-155.1	NIPA 4.1:20

Income Series:

3.1:1	Total labor compensation	2,922.0	3.1:2 + 3.1:3
3.1:2	Compensation of employees	2,698.7	NIPA 1.14:2
3.1:3	Self-employed labor compensation (FAI)	223.3	Imputation of compensation to self-employed assuming the same average wage for them as employees in the same industry
3.1:4	Government and government enterprises	534.3	1.3:11
3.1:5	Households and institutions	170.5	1.3:16
3.1:6	Private business	2,217.2	3.1:1 - 3.1:4 - 3.1:5

Table 3.1

Labor Compensation by Sector ($billions)

Notes: Compensation for the self-employed is imputed by industry from data in NIPA Tables 6.2, 6.5, 6.7, and 6.9. Self-employed were assumed to work an equal number of hours as employees in that industry at the same compensation rate.

3.2:1	Total business capital income	1,416.9	3.2:2 + 3.2:7
3.2:2	Private business income	1,143.1	3.2:3 - 3.2:4 + 3.2:5 - 3.2:6
3.2:3	Private business GDP	3,525.9	1.3:19
3.2:4	Less taxes on output	197.4	2.1:2
3.2:5	Plus subsidies for business output	31.8	2.2:23 + 2.2:24
3.2:6	Less labor compensation	2,217.2	3.1:6
3.2:7	Owner-occupied housing income	273.8	3.2:8 + 3.2:9
3.2:8	Owner-occupied housing output	273.6	1.3:20
3.2:9	Plus subsidies for owner-occ. housing	0.2	2.2:22

Table 3.2

Capital Income by Sector ($billions)

Notes: Private business income is determined by subtracting excise taxes on output from private business GDP, adding subsidies, and subtracting private business labor compensation.

3.3:1	Private gross domestic income	4,960.3	Sum of 3.3:2 through 3.3:6
3.3:2	Labor compensation	2,922.0	3.1:1
3.3:3	Capital income	1,416.9	3.2:1
3.3:4	Transfer payments to persons	521.4	2.2:8
3.3:5	Net interest paid to persons and business	70.1	2.2:15
3.3:6	Net private income from rest of world	29.9	3.3:7 + 3.3:8
3.3:7	Total net income from rest of world	4.6	2.3:2
3.3:8	Plus government net interest to rest of world	25.3	2.2:16
3.3:9	Private spending	4,960.3	3.3:1
3.3:10	Taxes paid	1,189.9	2.1:6 + 2.1:16
3.3:11	Personal consumption expenditures	3,052.2	1.1:2
3.3:12	Transfer payments to r.o.w. (net)	6.2	2.3:7
3.3:13	Dividends paid to government	5.9	2.2:17
3.3:14	Private savings	706.1	3.3:9 less the sum of 3.3:11 through 3.3:13

Table 3.3

Private Income, Spending and Savings ($billions)

3.4:1	Gross saving	594.2	3.4:2 + 3.4:3 + 3.4:4
3.4:2	Private savings	706.1	3.3:14
3.4:3	Government surplus or deficit (-)	-111.9	2.2:25
3.4:4	Capital grants received by the U.S. (net)	0.0	2.3:5
3.4:5	Gross investment	594.2	3.4:6 + 3.4:7
3.4:6	Gross private domestic investment	749.3	1.1:3
3.4:7	Net foreign investment	-155.1	2.3:11
3.4:8	Discrepancy check - sources less uses	0.0	3.4:1 - 3.4:5

Table 3.4

Total Sources and Uses of Savings ($billions)

Stock of Capital Series:

Table 4.1

Gross Investment by Type and Sector (billions of $1987)

4.1:1	Gross private domestic investment	749.3	1.2:3
4.1:2	Equipment	326.5	4.1:3 + 4.1:4 + 4.1:5 + 4.1:6
4.1:3	Corporate	178.7	Investment from BEA Wealth Series
4.1:4	Noncorporate	73.7	Investment from BEA Wealth Series
4.1:5	Household Housing	0.0	Zero
4.1:6	Total other purchases	56.1	Investment from BEA Wealth Series
4.1:7	Nonresidential structures	171.3	4.1:8 + 4.1:9 + 4.1:10 + 4.1:11
4.1:8	Corporate	79.3	Investment from BEA Wealth Series
4.1:9	Noncorporate	34.5	Investment from BEA Wealth Series
4.1:10	Household Housing	0.0	Zero
4.1:11	Total other purchases	58.6	Investment from BEA Wealth Series
4.1:12	Residential structures	225.2	4.1:13 + 4.1:14 + 4.1:15 + 4.1:16
4.1:13	Corporate	2.0	Investment from BEA Wealth Series
4.1:14	Noncorporate	26.0	Investment from BEA Wealth Series
4.1:15	Household Housing	195.1	Investment from BEA Wealth Series
4.1:16	Total other purchases	3.6	Investment from BEA Wealth Series
4.1:17	Inventory investment	26.3	4.1:18 + 4.1:19 + 4.1:20 + 4.1:21
4.1:18	Corporate	30.3	NIPA inventories split using Fed Flow of Funds, Balance Sheets for the U.S. Economy, C.9.
4.1:19	Noncorporate	-4.0	Above
4.1:20	Household Housing	0.0	Zero
4.1:21	Total other purchases	0.0	Zero
4.1:22	Unallocated investment	15.3	4.1:1 less sum of components
	Land Investment		
4.1:23	Land	69.7	Constructed using Ag. Depart. and Flow of Funds
4.1:24	Corporate	16.9	Above
4.1:25	Noncorporate	1.9	Above
4.1:26	Household Housing	50.8	Above
	Addendum		
4.1:28	Total reproducible investment goods	615.6	4.1:29 + 4.1:30
4.1:29	Total Business Investment	420.6	4.1:3 + 4.1:4 + 4.1:8 + 4.1:9 + 4.1:13 + 4.1:14 + 4.1:18 + 4.1:19
4.1:30	Total Home-owner Housing Investment	195.1	4.1:15
4.1:31	Total land investment	69.7	4.1:32 + 4.1:33
4.1:32	Total business land investment	18.8	4.1:24 + 4.1:25
4.1:33	Total home-owner housing land investment	50.8	4.1:26

Notes: The unallocated investment is the difference between what BEA says goes to either owner-occupied housing or private business. The principal recipient of this investment is the non-profit institution sector. We treat them as consumption.

Land is constructed from Department of Agriculture data and Federal Reserve Flow of Funds information. Total acreage is held constant except for the addition when Alaska and Hawaii became states. The nominal value of land is taken from Federal Reserve data until 1988 when its method suggests that the value of all corporate land fell by **90%**. We have adjusted this decline to follow the same general distribution of land across non-agricultural sectors with the price of non-agricultural land following the price of agricultural land after 1990.

4.2:1	Gross private domestic replacement	366.8	4.2:2 + 4.2:5 + 4.2:8
4.2:2	Equipment	211.8	4.2:3 + 4.2:4
4.2:3	Corporate	141.3	From stock calculation using BEA investment data
4.2:4	Noncorporate	70.5	From stock calculation using BEA investment data
4.2:5	Nonresidential structures	68.5	4.2:6 + 4.2:7
4.2:6	Corporate	46.6	From stock calculation using BEA investment data
4.2:7	Noncorporate	21.9	From stock calculation using BEA investment data
4.2:8	Residential structures	86.5	4.2:9 + 4.2:10 + 4.2:11
4.2:9	Corporate	1.3	From stock calculation using BEA investment data
4.2:10	Noncorporate	10.9	From stock calculation using BEA investment data
4.2:11	Household Housing	74.3	From stock calculation using BEA investment data
	Addendum		
4.2:12	Total replacement	366.8	4.2:13 + 4.2:14
4.2:13	Total business replacement	292.5	4.2:3 + 4.2:4 + 4.2:6 + 4.2:7 + 4.2:9 + 4.2:10
4.2:14	Total home-owner housing replacement	74.3	4.2:11

Table 4.2

Replacement Investment by Type and Sector (billions of $1987)

Notes: We use a geometric relative efficiency scheme with the productivity of an investment of a particular type and vintage declining at a fixed percentage each year. The rates of decline are those provided by Hulten and Wycoff in "The Estimation of Economic Depreciation Using Vintage Asset Prices: An Application of the Box-Cox Power Transformation," *Journal of Econometrics*, Vol. 15, No. 3, April 1981.

4.3:1	Equipment		4.3:2 + 4.3:3
4.3:2	Corporate	1,067.8	Lagged 4.3:2 + 4.1:3 - 4.2:3, 176.102 in 1947
4.3:3	Noncorporate	468.7	Lagged 4.3:3 + 4.1:4 - 4.2:4, 129.333 in 1947
4.3:4	Nonresidential structures		4.3:5 + 4.3:6
4.3:5	Corporate	1,468.5	Lagged 4.3:5 + 4.1:8 - 4.2:6, 530.273 in 1947
4.3:6	Noncorporate	697.9	Lagged 4.3:6 + 4.1:9 - 4.2:7, 249.795 in 1947
4.3:7	Residential structures		4.3:8 + 4.3:9 + 4.3:10
4.3:8	Corporate	65.4	Lagged 4.3:8 + 4.1:13 - 4.2:9, 24.906 in 1947
4.3:9	Noncorporate	539.7	Lagged 4.3:9 + 4.1:14 - 4.2:10, 131.685 in 1947
4.3:10	Household Housing	3,948.9	Lagged 4.3:10 + 4.1:15 - 4.2:11, 1038.538 in1947
4.3:11	Inventories		4.3:12 + 4.3:13
4.3:12	Corporate	808.5	NIPA inventories split using Fed Flow of Funds
4.3:13	Noncorporate	123.2	Above
4.3:14	Land		4.3:15 + 4.3:16 + 4.3:17
4.3:15	Corporate	947.5	Constructed using Ag. Depart. and Flow of Funds
4.3:16	Noncorporate	1,390.1	Above
4.3:17	Household Housing	2,287.2	Above
	Addendum		
4.3:18	Total capital stock	13,813.4	4.3:19 + 4.3:20
4.3:19	Total business capital	7,577.3	4.3:2 + 4.3:3 + 4.3:5 + 4.3:6 + 4.3:8 + 4.3:9 + 4.3:12 + 4.3:13 + 4.3:15 + 4.3:16
4.3:20	Total home-owner housing stock	6,236.0	4.3:10 + 4.3:17

Table 4.3

Capital Stock by Type and Sector (billions of $1987)

Notes: Land is valued at its opportunity costs in terms of the quantity of private business output that could be purchased. That is, the nominal value of land is "deflated" by the private business deflator. Values of the capital stock in 1987 come from the Fiscal Associates Model. They are accumulated investment from the historical BEA investment series using rates of decline from Hulten and Wycoff (see Table 4.2 for reference).

Table 4.4

Revaluation of Capital Stock by Type and Sector
(billions of $1987 of private output)

Notes: Because we use a geometric decline in efficiency, the revaluation of the stock of reproducible capital is zero. If other methods such as BEA are used, a revaluation amount must be included. This amount arises due to the difference between the accumulated stock and its remaining value. Consider a simple investment that is assumed to decline on a straight-line basis. The discounted value of the income over the remaining life of the investment will decline at a more rapid rate.

Revaluations are required because land has been valued at its opportunity cost, that is, the amount of private business output it could purchase. This value changes over time giving rise to "real" capital gains from holding land.

4.4:1	Equipment	0.0	Zero by construction
4.4:2	Corporate	0.0	Zero by construction
4.4:3	Noncorporate	0.0	Zero by construction
4.4:4	Nonresidential structures	0.0	Zero by construction
4.4:5	Corporate	0.0	Zero by construction
4.4:6	Noncorporate	0.0	Zero by construction
4.4:7	Residential structures	0.0	Zero by construction
4.4:8	Corporate	0.0	Zero by construction
4.4:9	Noncorporate	0.0	Zero by construction
4.4:10	Household Housing	0.0	Zero by construction
4.4:11	Inventories	0.0	Zero by construction
4.4:12	Corporate	0.0	Zero by construction
4.4:13	Noncorporate	0.0	Zero by construction
4.4:14	Land	97.6	4.4:15 + 4.4:16 + 4.4:17
4.4:15	Corporate	18.7	Constructed using Ag. Depart. and Flow of Funds
4.4:16	Noncorporate	35.5	Above
4.4:17	Household Housing	43.4	Above
	Addendum		
4.4:18	Total land revaluation	97.6	4.4:19 + 4.4:20
4.4:19	Total business land revaluation	54.2	4.4:15 + 4.4:16
4.4:20	Total home-owner housing land revaluation	43.4	4.4:17

Allocation of Private Output and Deflator Series:

Table 5.1

Gross Domestic Product by Producer and Major Good ($billions)

5.1:1	Gross domestic product	4,539.9	1.1:1
5.1:2	Personal consumption expenditures	3,052.2	1.1:2
5.1:3	Goods from private business	2,516.9	5.1:2 - sum of 5.1:4 thru 5.1:6
5.1:4	Owner-occupied housing output	273.6	1.3:20
5.1:5	Goods from households and institutions	170.5	1.3:21
5.1:6	Goods from government enterprises inc. Fed.	91.2	1.3:10
	Private domestic investment in capital		
5.1:7	Goods from private business	749.3	1.1:3
	Net exports of goods and services		
5.1:8	Goods from private business	-143.1	1.1:8
	Government purchases		
5.1:9	Labor compensation	478.7	2.2:5
5.1:10	Goods from private business	402.8	2.2:6

Table 5.2

Goods and Services by Producer ($billions)

5.2:1	Goods from private business	3,525.9	1.3:19
5.2:2	Owner-occupied housing output	273.6	1.3:20
5.2:3	Goods from households and institutions	170.5	1.3:21
5.2:4	Goods from government enterprises inc. Fed.	91.2	1.3:10

Table 5.3

Goods and Services by Producer in Constant Dollars (billions of $1987)

5.3:1	Goods from private business	3,525.9	1.4:14
5.3:2	Owner-occupied housing output	273.6	1.4:15
5.3:3	Goods from households and institutions	170.5	1.4:16
5.3:4	Goods from government enterprises inc. Fed.	91.2	1.4:10

5.4:1	Goods from private business	1.000	5.2:1 over 5.3:1
5.4:2	Owner-occupied housing output	1.000	5.2:2 over 5.3:2
5.4:3	Goods from households and institutions	1.000	5.2:3 over 5.3:3
5.4:4	Goods from government enterprises inc. Fed.	1.000	5.2:4 over 5.3:4
	Addendum implicit prices relative to private business output		
5.4:5	Owner-occupied housing output	1.000	5.4:2 over 5.4:1
5.4:6	Goods from households and institutions	1.000	5.4:3 over 5.4:1
5.4:7	Goods from government enterprises inc. Fed.	1.000	5.4:4 over 5.4:1

Notes: We chose private business output as the numéraire for our real accounts. This allows us to use the BEA levels of private output in constant dollars as the quantity of those goods and services. Therefore, the price for private output is one for all observations. Output from the three remaining producing sectors have both a price and quantity. The relevant prices are the prices relative to private output and the quantities are the BEA constant dollar measures. All income flows are similarly valued in terms of the amount of private output which could be obtained by that level of income. Financial assets follow the same convention.

5.5:1	Goods from private business	3,525.9	5.3:1
5.5:2	Owner-occupied housing output	273.6	5.2:2 divided by 5.4:1
5.5:3	Goods from households and institutions	170.5	5.2:3 divided by 5.4:1
5.5:4	Goods from government enterprises inc. Fed.	91.2	5.2:4 divided by 5.4:1

5.6:1	Gross domestic product	4,539.9	5.1:1 divided by 5.4:1
5.6:2	Personal consumption expenditures	3,185.9	5.6:1 - 5.6:7 - 5.6:8 - 5.6:9 - 5.6:10
5.6:3	Goods from private business	2,650.6	5.6:2 - 5.6:4 - 5.6:5 - 5.6:6
5.6:4	Owner-occupied housing output	273.6	5.5:2
5.6:5	Goods from households and institutions	170.5	5.5:3
5.6:6	Goods from gov't enterprises inc. Fed.	91.2	5.5:4
	Private domestic investment in capital		
5.6:7	Goods from private business	615.6	4.1:28
	Net exports of goods and services		
5.6:8	Goods from private business	-143.1	5.1:8 divided by 5.4:1
	Government purchases		
5.6:9	Labor compensation	478.7	5.1:9 divided by 5.4:1
5.6:10	Goods from private business	402.8	5.1:10 divided by 5.4:1

5.7:1	Private gross domestic income	4,760.8	5.7:2 + 5.7:3 + sum of 5.7:6 thru 5.7:9
5.7:2	Labor compensation	2,922.0	3.3:2 divided by 5.4:1
5.7:3	Total Capital income	1,050.1	5.7:4 - 5.7:5
5.7:4	Capital factor income	1,416.9	3.3:3 divided by 5.4:1
5.7:5	Capital replacement	366.8	4.2:12
5.7:6	Net change in value of land	167.3	4.4:18 + 4.1:31
5.7:7	Transfer payments to persons	521.4	3.3:4 divided by 5.4:1
5.7:8	Net interest paid to persons and business	70.1	3.3:5 divided by 5.4:1
5.7:9	Net private income from rest of world	29.9	3.3:6 divided by 5.4:1
5.7:10	Private spending	4,760.8	5.7:1
5.7:11	Taxes paid	1,189.9	3.3:10 divided by 5.4:1
5.7:12	Personal consumption expenditures	3,185.9	5.6:2
5.7:13	Transfer payments to r.o.w. (net)	6.2	3.3:12 divided by 5.4:1
5.7:14	Dividends paid to government	5.9	3.3:13 divided by 5.4:1
5.7:15	Net private savings	372.9	5.7:10 - sum of 5.7:11 thru 5.7:14
	Addendum		
5.7:16	Disposable income	3,558.8	5.7:17 + 5.7:18
5.7:17	Consumption	3,185.9	5.7:12
5.7:18	Net savings	372.9	5.7:15

Table 5.4

Implicit Deflators for Goods and Services by Producer (1987=1.000)

Table 5.5

Goods and Services by Producer at Constant Opportunity Cost (billions of $1987 of private output)

Table 5.6

Gross Domestic Product by Producer and Major Good (billions of $1987 of private output)

Notes: The level of real consumption is derived by subtracting the amount of real private output going to exports, government, and investment purposes. The investment goods level reflects only those goods BEA identifies as being invested in either housing or private business capital.

Table 5.7

Net Private Income with Capital Gains, Spending and Savings (billions of $1987 of private output)

Notes: This table follows Table 3.3 but adds several new features. First, it measures income in real terms. Second, it subtracts capital replacement to represent the net rather than gross income. Capital gains from revaluations of reproducible capital must be added (in our case these are zero). And finally, the proceeds from land revaluation and land investment (net change in the value of land) must be added to reflect income from all sources. Factor payments from foreign operations are netted out to yield domestic income.

Table 5.8

Total Sources and Uses of Net Savings (billions of $1987 of private output)

5.8:1	Net savings	261.0	5.8:2 + 5.8:3 + 5.8:4
5.8:2	Net private savings	372.9	5.7:15
5.8:3	Government surplus or deficit (-)	-111.9	3.4:3 divided by 5.4:1
5.8:4	Capital grants received by the U.S. (net)	0.0	3.4:4 divided by 5.4:1
5.8:5	Net investment	261.0	5.8:6 + 5.8:9
5.8:6	Net private domestic investment	416.1	5.8:7 + 5.8:8
5.8:7	Reproducible investment	248.8	4.1:28 - 4.2:12
5.8:8	Land investment	167.3	4.4:18 + 4.1:31
5.8:9	Net foreign investment	-155.1	3.4:7 divided by 5.4:1
5.8:10	Discrepancy check - sources less uses	0.0	5.8:1 - 5.8:5

Notes: This table recasts Table 3.4 in terms of total investment (including land). Land investment is added to investment in reproducible capital assets. Net foreign investment is treated as a financial claim and is, therefore, measured in terms of its opportunity price.

Factor Income and Wealth Series:

Table 6.1

Labor Compensation, Hours Worked, and Wage Rates by Sector (billions of $1987 of private output)

6.1:1	Total labor compensation	2,922.0	6.1:2 + 6.1:3 + 6.1:4
6.1:2	Government and government enterprises	534.3	3.1:4 divided by 5.4:1
6.1:3	Households and institutions	170.5	3.1:5 divided by 5.4:1
6.1:4	Private business	2,217.2	3.1:6 divided by 5.4:1
6.1:5	Total hours worked (bil. hours)	204.262	Sum of 6.1:6 thru 6.1:8
6.1:6	Government and government enterprises	31.783	Constructed from NIPA 6.5, 6.7, and 6.9
6.1:7	Households and institutions	13.308	Above
6.1:8	Private business	159.171	Above
6.1:9	Real wage rate (hourly)	14.31	6.1:1 divided by 6.1:5
6.1:10	Government and government enterprises	16.81	6.1:2 divided by 6.1:6
6.1:11	Households and institutions	12.81	6.1:3 divided by 6.1:7
6.1:12	Private business	13.93	6.1:4 divided by 6.1:8

Notes: All labor compensation is deflated by the private output deflator. Total hours worked is constructed from BEA information on hours worked by employees. An imputation for the hours of the self-employed is added by assuming that they provide the same average level of hours by industry as employees. This is directly analogous to the method used to impute compensation for the self-employed.

Table 6.2

Capital Income by Sector in Constant Dollars (billions of $1987 of private output)

6.2:1	Gross capital factor income	1,416.9	6.2:2 + 6.2:3
6.2:2	Private business income	1,143.1	3.2:2 divided by 5.4:1
6.2:3	Owner-occupied housing income	273.8	3.2:7 divided by 5.4:1
6.2:4	Net capital income	1,147.7	6.2:5 + 6.2:6
6.2:5	Private business income	904.8	6.2:2 - 4.2:13 + 4.4:19
6.2:6	Owner-occupied housing income	242.9	6.2:3 - 4.2:14 + 4.4:20
6.2:7	Net aftertax capital income	761.0	6.2:4 - (2.1:6 + 2.1:24 + 2.1:25 + 2.1:26) divided by 5.4:1
6.2:8	Private business income	568.9	6.2:7 - 6.2:9
6.2:9	Owner-occupied housing income	192.0	6.2:6 - (2.1:11 + 2.1:25 + 2.1:26 times 4.3:20 divided by 4.3:18) divided by 5.4:1
6.2:10	Net aftertax rate of return	5.51%	6.2:7 divided by 4.3:18
6.2:11	Private business income	7.69%	6.2:8 divided by 4.3:19
6.2:12	Owner-occupied housing income	2.86%	6.2:9 divided by 4.3:20

Notes: Gross capital income is constructed by dividing the nominal levels by the private business deflator. Net capital income subtracts replacements and adds in revaluations. Net aftertax income subtracts the deflated taxes on business. In the case of home-owner occupied housing, estate taxes are allocated by the proportion of housing stock to total capital stock. The rates of return are obtained by dividing by the appropriate capital stocks.

	Nominal value of net claims on foreigners		
6.3:1	Net U.S. financial claims on foreigners	-51.1	Fed Flow of Funds, Balance Sheets for the U.S. Economy, C.9., Table B.10:30
6.3:2	Net foreign investment	-155.1	3.4:7
6.3:3	Revaluation of assets	71.9	Fed Flow of Funds, above
6.3:4	Net U.S. financial claims on foreigners	-51.1	6.3:1 divided by 5.4:1
6.3:5	Net foreign investment	-155.1	5.8:9
6.3:6	Revaluation of assets	71.1	6.3:4 - 6.3:5 - lagged 6.3:4
6.3:7	Total capital stock, wealth	13,813.4	4.3:18
6.3:8	Domestic net worth	13,762.3	4.3:18 + 6.3:1 divided by 5.4:1

Table 6.3

National Wealth and Domestic Net Worth
(6.3:1,2 in $billions; remainder in billions of $1987 of private output)

Notes: Domestic net worth is constructed using the Fed's measure of the stock of net U.S. claims on foreigners. These are treated as financial claims and, therefore, must be adjusted for revaluations. The domestic net worth is the total U.S. capital stock plus net claims on foreigners.

6.4:1	Population (mid-period, millions)	242.9	NIPA 2.1:34
6.4:2	Civilian labor force (millions)	119.9	Employment & Earnings, A-1
6.4:3	Civilian unemployed (millions)	7.4	Employment & Earnings, A-1
6.4:4	Unemployment rate	6.2%	Employment & Earnings, A-1

Table 6.4

Miscellaneous Demographic Information

Appendix B: Results of Regression Equations

Following Boskin, we estimated two consumption function equations over the period 1949 to 1994. The dependent variable in each was the log of consumption per capita. The independent variables of aftertax income per capita, aftertax income per capita lagged one year, domestic net worth per capita lagged one year, and the civilian unemployment rate also were in log form. In one equation, however, the aftertax rate of return to capital is in linear form and in the second equation it is in log form.

Variable	Coefficient-Boskin[1]	Coefficient-Update
Constant	-3.8* (1.3)	-0.62* (0.20)
Linear aftertax rate of return to capital	-1.07* (0.31)	-1.84* (0.49)
Log Aftertax Income	0.56* (0.12)	0.72* (0.10)
Log Aftertax Income, lagged one year	0.18** (0.08)	0.10 (0.08)
Log of Domestic net worth, lagged one year[2]	0.28* (0.06)	0.24* (0.11)
Log of Civilian unemployment rate	-0.003 (0.01)	-0.033** (0.11)
RHO		0.64* (0.11)
Equation Statistics		
R^2	0.99	0.99
Sum of Squared Residuals	0.00171	0.000758
Standard Error of Regression	0.0088	0.01377
Time period covered	1929 to 1969	1949 to 1994

Table B-1

Results of Least Squares Regression with Cochrane-Orcutt Autocorrelation Adjustment Dependent Variable: Log Consumption/Population
(Standard Error of the Estimate in Parenthesis)

*Indicates significance at the 1% level.
**Indicates significance at the 5% level.

[1]Michael J. Boskin, "Taxation, Saving and the Rate of Interest," *Journal of Political Economy*, Vol. 86, No. 2, Part 2, April 1978, Equation 2, p. S13.

[2]Boskin used the market value of private nonhuman assets. Our measure is described in Table 6.3 of Appendix A.

Table B-2

Results of Least Squares Regression with Cochrane-Orcutt Autocorrelation Adjustment
Dependent Variable:
Log Consumption/Population
(Standard Error of the Estimate in Parenthesis)

*Indicates significance at the 1% level.
**Indicates significance at the 5% level.

[1]Michael J. Boskin, "Taxation, Saving and the Rate of Interest," *Journal of Political Economy*, Vol. 86, No. 2, Part 2, April 1978, Equation 4, p. S14.

[2]Boskin used the market value of private nonhuman assets. Our measure is described in Table 6.3 of Appendix A.

Variable	Coefficient-Boskin[1]	Coefficient-Update
Constant	-0.60 (1.29)	-1.00* (0.17)
Linear aftertax rate of return to capital	-0.041* (0.011)	-0.081* (0.026)
Log Aftertax Income	0.56* (0.12)	0.66* (0.10)
Log Aftertax Income, lagged one year	0.17** (0.08)	0.13 (0.08)
Log of Domestic net worth, lagged one year[2]	0.28* (0.06)	0.28* (0.11)
Log of Civilian unemployment rate	-0.004 (0.01)	-0.030** (0.01)
RHO		0.68* (0.11)
Equation Statistics		
R^2	0.99	0.99
Sum of Squared Residuals	0.0017	0.00787
Standard Error of Regression	0.0088	0.01402
Time period covered	1929 to 1969	1949 to 1994

Table B-1 presents the regression results for the equation using the aftertax return in linear form. Because of the presence of serial correlation, the equation was estimated using the Cochrane-Orcutt adjustment. The table also contains the results reported in the Boskin article. Table B-2 presents the same type of results for the equation using the aftertax return in log form.

Because consumption or saving functions are embodied in a larger model of economic activity, "explanatory" variables such as aftertax income, wealth or the aftertax return depend on other exogenous variables. Parameter estimates from single equation methods using these not-so-independent variables may be biased.

Table B-3

Results of Instrumental Variables Technique using Principal Components with Cochrane-Orcutt Autocorrelation Adjustment[1]
Dependent Variable:
Log Consumption/Population
(Standard Error of the Estimate in Parenthesis)

*Indicates significance at the 1% level.
**Indicates significance at the 5% level.

[1]This measure is described in Table 6.3 of Appendix A.

Variable	Linear Aftertax Return	Log Aftertax Return
Constant	-0.35 (0.26)	-0.81* (0.21)
Aftertax rate of return to capital	-2.37* (0.77)	-0.12* (0.04)
Log Aftertax Income	0.60* (0.11)	0.596* (0.11)
Log Aftertax Income, lagged one year	0.305 (0.066)	0.315* (0.066)
Log of Domestic net worth, lagged one year[1]	0.14 (0.13)	0.13 (0.13)
Log of Civilian unemployment rate	-0.013 (0.025)	-0.012 (0.025)
RHO	0.54* (0.12)	0.54* (0.12)
Equation Statistics		
R^2	0.99	0.99
Sum of Squared Residuals	0.0178	0.0179
Standard Error of Regression	0.0211	0.0211
Time period covered	1929 to 1969	1949 to 1994

To address this bias we used an instrumental variable technique which consists of two stages. First, principal components of a set of exogenous variables, such as tax rates, monetary policy and population, are formed. The method regresses each explanatory variable on this set of exogenous variables. The second step takes the fitted values from the estimated equation for each explanatory variable and uses them as the regressors in the original consumption function.

Table B-3 presents the results of the second step for the updated consumption functions using the aftertax rate of return in linear and log form. Although Boskin also estimated consumption functions with instrumental variables, he added a price expectation term that we do not use.

Appendix C: Computing the Elasticity of Saving with Respect to the Aftertax Rate of Return to Capital

The regressions reported in this study use consumption as the dependent variable. The following steps show how the coefficient on the aftertax return to capital in a consumption equation can be translated into the elasticity of saving with respect to the aftertax return.

The elasticity of saving with respect to the aftertax return to capital (ε_S) is the percent change in saving (S) divided by the percent change in the return (R), or:

(1) $\varepsilon_S = \delta S/S \div \delta R/R = (\delta S/\delta R) \div (S/R) = (\delta S/\delta R) * R/S.$

In a loglinear regression, the coefficient on an explanatory variable is the elasticity of the dependent variable with respect to the explanatory variable. Thus, in the consumption function estimated in the report, the coefficient on the log R (say α) is the elasticity of consumption (C) with respect to the aftertax return to capital, or

(2) $\varepsilon_C = (\delta C/\delta R) * R/C = \alpha.$

Because aftertax income equals saving plus consumption, a $1 dollar increase in saving is exactly matched by a $1 dollar decrease in consumption. Therefore,

(3) $\delta S/\delta C = -1.$

Substituting (2) and (3) in to (1) yields:

(4) $\varepsilon_S = [(\delta C/\delta R) * R/C] * [\delta S/\delta C * C/S] = \alpha * (-1) * C/S.$

In other words, the elasticity of saving is minus the coefficient on return from the consumption function times the ratio of consumption to savings.

The updated elasticities shown in Table 7 were evaluated for 1987. For example, in the case of the instrumental variable estimate using the log of return, the value for α is -0.12. [See Table A-3.] In 1987, consumption was $3,185.9 billion and savings $372.9 billion. [See Table 6.] Thus,

(5) $\varepsilon_S = \alpha * (-1) * C/S = -0.12 * (-1) * (3,185.9/372.9) = 0.12 * 8.544 = 1.025.$

In the case of the equation with the linear aftertax return,

(6) $\varepsilon_S = [\alpha * (-1) * C/S] * R.$

Endnotes

1. Michael J. Boskin, "Taxation, Saving and the Rate of Interest," *Journal of Political Economy*, Vol 86, No. 2, Part 2, April 1978, pp. S3-S28.

2. For a discussion of current government forecasting methods and dynamic scoring see Gary & Aldona Robbins, "Cooking the Books: Exposing the Tax and Spend Bias of Government Forecasts," Lewisville, TX: TaxAction Analysis, Policy Report No. 129, February 1995.

3. The Joint Committee announced that it will continue to explore the feasibility of incorporating macroeconomics effects into its estimates. See The Joint Committee on Taxation, "Chairmen Archer and Packwood Announce Improvements in the Joint Committee Revenue Estimating Process," Press Release, Washington, DC, May 18, 1995.

4. Boskin, p. S4.

5. Specifically, the elasticity of saving with respect to its return is the percentage change in saving divided by the percent change in the return. Note that the term "interest elasticity" refers to a broader measure of return, that is, the aftertax return to all capital.

6. The value depends upon the exact specification of his estimating equations. See Boskin, Table 3, p. S16.

7. Boskin, p. S3.

8. Private return data are the Basic Year-End Cumulative Wealth Series from Ibbotson Associates, Inc., *Stocks, Bonds, Bills, and Inflation 1992 Yearbook*, Chicago: IL, 1992, page 84. The 5-year return is the return in the year 6 of an interval divided by the rate of return in year 1 taken to the (1/5) power. Government borrowing rates are based on monthly historical rates obtained from the Federal Reserve Bank of Saint Louis.

9. The average of 5-year returns is 10.1 percent for stocks versus 5.3 percent for long-term government bonds. The average standard deviation, which measures risk, is 8.3 percent for stocks versus 2.9 percent for long-term government bonds.

10. The reason is that prices on goods and services also tend to go up with inflation.

11. Some minor amount of funds will be used to purchase intangibles such as goodwill, patents and trademarks.

12. L. Christensen and D. Jorgenson, "U.S. Income, Saving and Wealth, 1929-69," *Review on Income and Wealth*, series 19, No. 4, December 1973, pp. 329-62.

13. The major difference is that we construct our economic accounts by first converting all flows into constant dollar measures and then accumulate. Christensen and Jorgenson first create their stocks in nominal terms and then deflate them.

14. Refer to Table 6.2 in Appendix A for detail.

15. We used the Commerce Department's imputation of the return to owner-occupied housing.

16. Christensen and Jorgenson follow this method. An index is a numeric proxy for a dollar amount. For example, a series on government expenditures of $1, $1.25 and $2.5 billion might be represented as 0.4, 0.5 and 1.0.

17. Specifically, the numeraire is the Commerce Department's implicit deflator for private output which is the nominal spending on private output divided the quantity of private output.

18. Because the deflator equals 1 in 1987, the nominal and real values for 1987 are the same.

19. Depreciation reflects both the current decline in efficiency and the present value of future declines in efficiency. See Dale W. Jorgenson and Ralph Landau, editors, *Technology and Capital Formation*, Cambridge, MA: The MIT Press, 1989, pp. 5-11.

20. See Table 4.4 in Appendix A for detail.

21. We construct a capital stock series primarily using data from the Commerce Department's Bureau of Economic Analysis and a few series from the Federal Reserve's Flow of Funds. The stock in any year is the stock from the previous year plus gross investment less depreciation. See Appendix A for detail.

22. Consumption, aftertax income and domestic net wealth were divided by population to put them on a per capita basis.

23. The least squares method was corrected for serial correlation using the Cochrane-Orcutt method. Instrumental variables corrects for the fact that the explanatory variables are not truly independent.

24. Boskin, p. S25.

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