Executive Summary

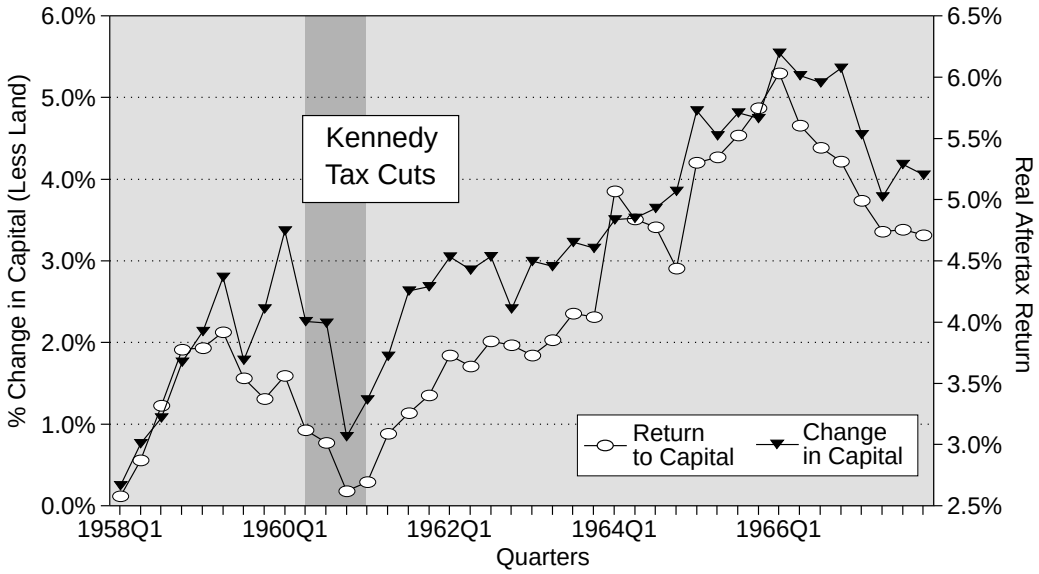
It is often said that "the business of America is business." Today, the majority of policy makers acknowledge that it is the nation's businesses that are responsible for economic growth and job creation. Clearly, if our economy is to grow and produce jobs at a consistent, healthy pace, businesses must be growing and investing in new plant, equipment, and technologies. And for businesses to have money to invest, sufficient capital must be available in the form of savings.

In a previous report, we showed that the recent decline in America's saving rate is tied to the tax treatment of capital. In this report, we show that a similar relationship exists between business capital formation and the tax treatment of new investment. We find that the return to new investment, after taxes, depreciation and inflation, has been remarkably stable over the last forty years. The reason is that investors quickly counter shocks that cause their aftertax return to go up or down by changing their investment behavior.

"The Kennedy tax cuts of the 1960s produced one of the fastest periods of capital formation in our nation's history. "

In short, increases in the aftertax return have led to an increase in the rate of capital formation until the return was driven back down to its long-run, economy-wide average of 3.4 percent. Conversely, decreases in the aftertax return have been followed by a decrease in investment until the aftertax return went back to 3.4 percent. And the adjustments generally take five years or less.

A major source of "shock" is changes in tax policy. Numerous tax bills in the past four decades have caused the aftertax return to new investment to increase or decrease and, with it, the amount of investment. For example, the Kennedy tax cuts of the 1960s produced one of the fastest periods of capital formation in our nation's history. Similar relationships between tax policy and capital formation are found in the 1970s, 1980s and up to the present.



The results of this study have clear implications for tax policy and the tax reform debate. *The evidence suggests that lowering taxes on capital may produce enough positive economic effects to offset most or all of the static revenue loss.* Unfortunately, the current practice of government revenue estimators is to deny that any relationship exists between the aftertax return to capital and capital formation. Unless this practice is corrected, the outcome of the upcoming tax reform debate will produce unintended consequences and missed opportunities for the economy and the budget.

EATING OUT OUR SUBSTANCE (II): How Taxation Affects Investment

Introduction

A common concern among public policy analysts is the anemic savings rate of the United States, particularly in the last ten years. Remedying this situation will require reducing the bias against saving and investment in the existing tax system.

Rewards to saving and investment usually come in the form of dividends, profits, interest and capital gains. Opponents to lowering taxes on capital claim it is unfair, and that such a change would only benefit the rich without increasing savings or investment. However, this static view of the world assumes that total economic activity remains the same whether taxes are raised, lowered or are left unchanged. If taxes *do* affect the willingness of people to work, save and invest, this appeal to fairness is a hollow one.

"If taxes do affect the willingness of people to work, save and invest, this appeal to fairness is a hollow one."

This report is the second in a series aimed at determining and quantifying information and relationships in the current tax reform debate. Initial reports focus on how saving, investment, taxation and growth relate to one another. Obviously, 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. Later reports will analyze the economic, revenue and other effects of specific tax reform proposals using the evidence developed in the initial studies.

The first report, issued in September, documented a strong historical relationship between private savings and the average, economy-wide return to capital.[1] Updating a 1978 study by Michael Boskin, we found that a 10 percent increase (decrease) in the aftertax rate of return to capital results in between a 7 to 11 percent increase (decrease) in saving.

This finding is important because it nullifies the premise that saving is not affected by its return and, therefore, by tax policy. In other words, our study concludes that there is a direct relationship between tax policy and the savings rate. However, the study does not establish a link between the return to capital and *investment.* That is the subject of this report.

While saving and investment are closely linked, there is an important difference. Most simply, saving is consumption that has been postponed. Investment is the act of acquiring physical assets such as plant equipment or land. In other words, saving is the *amount* of postponed consumption, while investment is what is done with these savings. For the total economy, saving by private businesses and individuals must finance the nation's investment, government borrowing and any investment made abroad.

This report examines two key questions about investments. Specifically: (1) On what basis do investors invest another dollar? and (2) How does taxation affect investment?

Why Investors Invest

What determines whether an individual investor will expand his or her portfolio? What underlies the decision of a business to purchase another computer or build another factory? Understanding the components of these decisions is key to understanding how tax policy may affect investment.

Although the analysis can quickly become complex and technical, the underlying premise is straightforward. For investment to occur, someone must save, that is, postpone consumption. In exchange for this postponed consumption, investors demand a reward, or return. And as long as the expected return is greater than a minimally-acceptable return, the investor will continue to invest. Furthermore, this process continues as long as the expected rate of return, after taxes and inflation, is equal to or greater than what could be earned otherwise.

"For investment to occur, someone must save, that is, postpone consumption."

What becomes complicated is sorting out the factors, such as taxes, inflation, risk, and, in the case of physical assets, depreciation, that determine the investor's return. The following discussion summarizes how these factors interact. [Appendix A contains a technical discussion of these relationships.]

The Return to Investment (Capital)

An investor cares most about the return he or she gets to keep after inflation and taxes. In the case of a physical asset, the added complication of depreciation also comes into play. In contrast to a bond which returns its principal at maturity, the value of most real assets drops toward zero over their useful lives. Therefore, the real asset also must earn enough to recover the initial cost of the investment (or principal).

Taxes, inflation and the need to replace some assets reduce the return that the investor gets to keep. We call the proceeds going to an investor adjusted for taxes, inflation and depreciation *the real aftertax return to capital*. The *pretax return to capital* is the real aftertax return plus the adjustments.

From where does this pretax return come? It is paid out of the extra output produced by the additional investment.[2] For example, suppose that adding another computer would raise a company's productivity enough to generate another $10,000 in annual sales. For the investment to be made, that $10,000 would have to be sufficient to cover all the costs of the computer with enough left over to reward the investor. The less capital that a company has, the higher will be the pretax return. More investment will lead to a lower pretax return.[3]

"In general, the higher the taxes on capital, the greater the pretax return will have to be to achieve a specific real aftertax return."

Taxes

Taxes that must be paid from capital income come from many sources, including personal and corporate income taxes, estate and gift taxes, property taxes, and sales or excise taxes. In general, the higher the taxes on capital, the greater the pretax return will have to be to achieve a specific real aftertax return.

Inflation

Inflation also raises the pretax return to capital. Moreover, there is an interaction between taxes and inflation such that as either taxes or inflation increase, the pretax return must increase even faster.[4] Real assets offer some protection against inflation in that they produce goods and services whose prices also move with inflation.

Depreciation

Real assets, such as equipment and structures, add extra complexity. Unlike financial assets such as bonds, most real assets wear out or become obsolete. As a

result, their values decline over time with their productive lives. This declining value is called *depreciation*. The faster an asset depreciates, the higher must its pretax return be to meet a specific real aftertax return.

Expectations and Risk

Up to this point we have assumed that the investor has perfect information about the future. However, this is not the way the real world operates. Rather, the investor and the market must make guesses about future inflation and taxes. These guesses are incorporated into our analysis as "expected" inflation rates and "expected" tax rates.

Investments in some businesses, such as a wildcat oil exploration company, are riskier than in others, such as a regulated public utility. An investor will assume higher risk only if the real aftertax return to that investment compensates for the increased risk compared to other investments.[5] The real aftertax return to capital for the economy as a whole reflects the average risk premium that investors place on U.S. capital.[6]

The Real Aftertax Rate of Return to Capital

The real aftertax rate of return to capital is not observed directly. However, because we can estimate the pretax return to capital and the various adjustments, it is possible to infer the value of the real aftertax return to capital. Based on the relationships we have just discussed:[7]

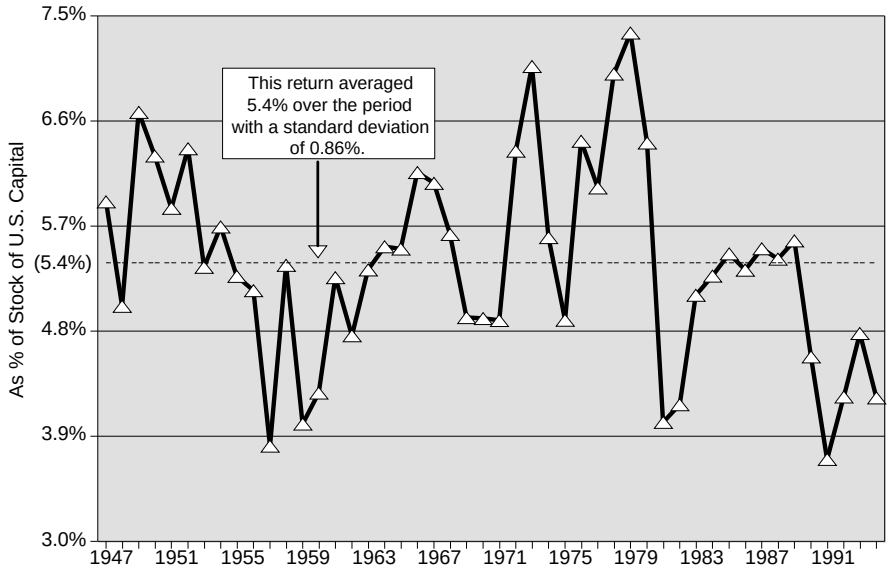
Pretax Return to Capital =	**Real Aftertax Return + Inflation adjustment + Tax adjustment + Depreciation adjustment**
or	
Real Aftertax Return =	**Pretax Return - Inflation adjustment - Tax adjustment - Depreciation adjustment**

In the previous study, we followed this principle to estimate the *average* real aftertax rate of return to capital. The average return was computed as the income to U.S. capital after inflation, taxes and depreciation divided by the net stock of U.S. capital. We found that, in 1994, the average real aftertax return to capital was 4.23 percent. In other words, U.S. investors received $423, on the average, for every $10,000 of capital they owned.[8] [See Figure 1.]

Figure 1

Net Average Aftertax Return to Capital

Source: Gary Robbins and Aldona Robbins, "Eating Out Our Substance: How Taxation Affects Saving," Lewisville, TX: TaxAction Analysis, Policy Report No. 131, August 1995



Return on the Margin

However, investors do not look at average returns in deciding whether to invest in another piece of capital. They want to know what the extra, or *marginal*, return will be. And this marginal return will differ from the average return primarily because the appropriate adjustments for depreciation and taxes also will differ.

Depreciation Adjustment

Depreciation is the decline in value of a real asset over time as its productiveness diminishes. Sometimes this decline is due to physical wear and tear. More often an asset becomes obsolete due to improved technology. To maintain the productive capacity of the stock of capital, there must be enough new investment each year to cover depreciation.

"… one-sixth of the stock of corporate equipment must be replaced each year for the economy to hold its ground."

Average depreciation is the amount of investment needed to keep the stock of capital whole. For example, in 1994, equipment in the corporate sector amounted to $1,362 billion. Maintaining productive capacity required an investment of $238.4 billion in equipment, or an average depreciation rate of 17.5 percent. In other words, one-sixth of the stock of corporate equipment must be replaced each year for the economy to hold its ground.[9]

Marginal depreciation differs from the average because it is based upon the total amount, or stock, of each type of asset.[10] Average depreciation relates more to the additions to, or investment in, each asset type. Because the stock of an asset is usually larger than investment any one year, average depreciation tends to be more volatile than marginal depreciation. And volatility increases for shorter-lived assets.[11] [See Figure 2.]

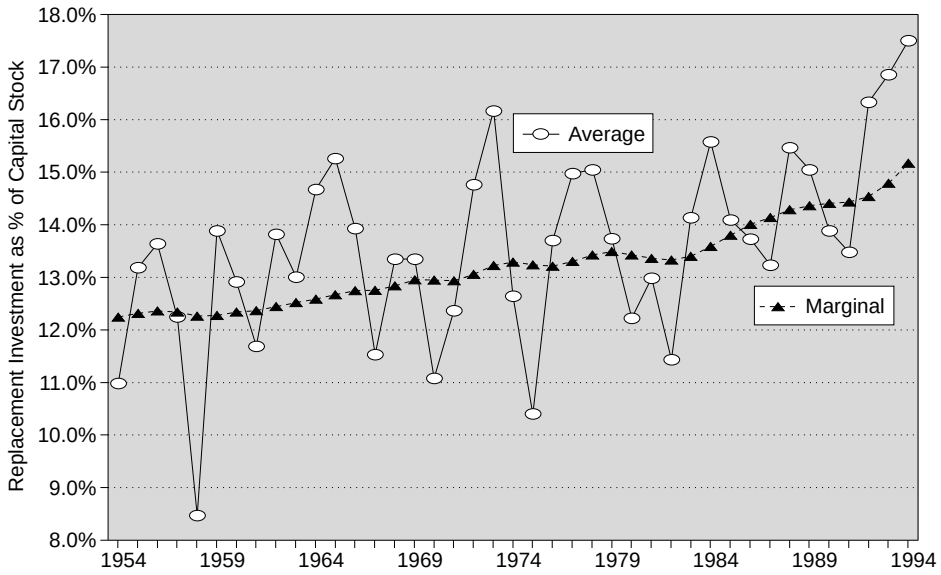


Figure 2

Average & Marginal Depreciation for Corporate Equipment

- To the extent that marginal depreciation is lower than the average, a lower pretax return to capital is needed to provide a specific aftertax return.

Tax Adjustment

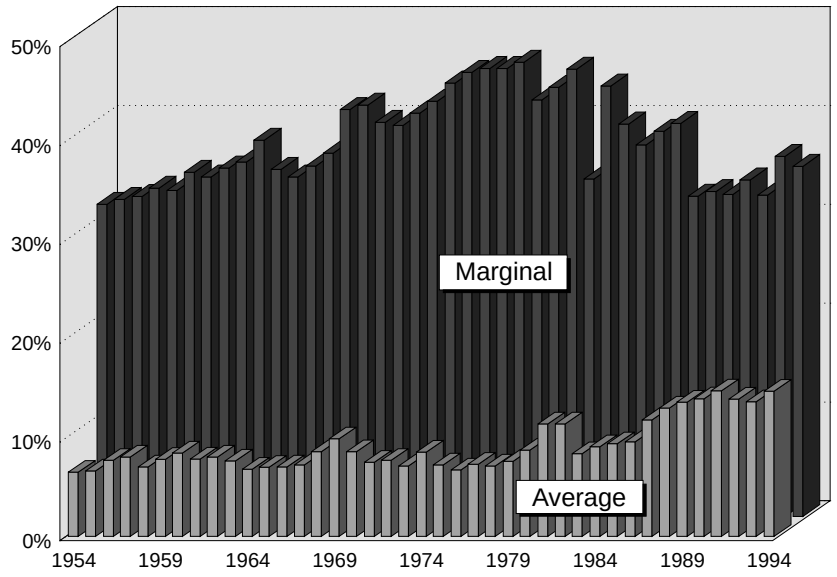
"A taxpayer's marginal income tax rate is the rate at which the next dollar of income is taxed."

Marginal tax rates are often higher than average rates because of the structure of the tax system. A taxpayer's marginal income tax rate is the rate at which the *next* dollar of income is taxed. The average rate is lower because it includes exemptions, deductions and income taxed at lower rates.[12] For example, marginal personal

income tax rates on noncorporate business have been up to five times higher than average rates over the last four decades. In 1994, the marginal rate was 35.5 percent while the average rate was 14.7 percent. [See Figure 3.]

Figure 3

Average & Marginal Personal Income Tax Rates on Noncorporate Business



- To the extent that marginal tax rates exceed the averages, a higher pretax return to capital is needed to provide a specific aftertax return.

Tax depreciation is another reason marginal tax rates differ from averages. As previously discussed, depreciation is the decline in value of an asset over time. Tax depreciation, however, specifies how much of the original cost of an asset a business can deduct from gross income in a particular year. *Because it is an artificial construct of the tax code, tax depreciation bears little or no resemblance to actual depreciation.*[13]

"…the value of the depreciation deduction for corporate structures was worth 43 percent more ten years ago than it is today."

Tax depreciation has changed several times over the last four decades. For example, the value of the depreciation deduction for corporate structures was worth 43 percent more ten years ago than it is today.[14] [See Table 1.] Because tax depreciation is a deduction from income for tax purposes, changes in its rules must be taken into account to measure marginal tax rates.

- The less generous the tax depreciation, the higher will be the pretax return to capital needed to provide a specific aftertax return.

Marginal Pretax Return

As discussed previously, the pretax return is paid out of the extra output produced by additional investment. Because adding more and more capital produces diminishing returns, the more investment, the lower the pretax return will be, while less investment is associated with a higher pretax return. Put another way:

- The lower the pretax return to capital needed to provide a specific aftertax return, the more investment there will be.

The last piece of information we need to infer the real aftertax rate of return to capital is the *marginal* pretax return. While this could present a problem, economic theory comes to the rescue. It tells us that the marginal return to productive factors, capital and labor, must be exactly equal to the average return. That is, the return paid to the first unit of a specific type of capital is the same as what is paid to the last. Similarly, the wage paid to the first worker in a particular job category is the same as the last.[15]

Tax Depreciation for Corporate Capital		
Present Value Tax Depreciation[1]		
Year	Equipment	Structures
1954	88.2%	72.8%
1955	88.9%	74.7%
1956	88.4%	74.9%
1957	86.4%	71.8%
1958	85.5%	68.7%
1959	85.7%	70.2%
1960	85.2%	68.6%
1961	85.3%	68.0%
1962	88.2%	70.5%
1963	91.0%	73.3%
1964	90.8%	73.1%
1965	90.4%	72.4%
1966	89.0%	70.2%
1967	88.3%	67.3%
1968	88.4%	67.8%
1969	87.2%	64.3%
1970	84.8%	56.7%
1971	87.9%	55.7%
1972	88.7%	57.1%
1973	88.3%	57.9%
1974	87.5%	54.1%
1975	86.8%	50.6%
1976	88.1%	52.4%
1977	89.1%	55.2%
1978	88.2%	54.5%
1979	86.9%	52.5%
1980	84.8%	46.6%
1981	86.6%	70.5%
1982	87.1%	70.8%
1983	88.8%	73.7%
1984	88.4%	71.1%
1985	89.8%	71.2%
1986	91.0%	60.5%
1987	89.7%	55.9%
1988	88.4%	52.3%
1989	88.5%	54.0%
1990	88.5%	52.9%
1991	89.6%	53.7%
1992	90.7%	54.7%
1993	91.6%	53.9%
1994	90.9%	51.6%

Table 1

Tax Depreciation for Corporate Capital

1 Value of the income tax deduction for depreciation adjusted for the time value of money. Under expensing, which allows immediate write-off of capital acquisition costs, the present value would be 100%.

For the economy as a whole, the pretax return to capital is income to capital after inflation and depreciation divided by the total stock of capital. In 1994, the pretax return on U.S. capital was 7.4 percent. [See Table 2.]

Table 2

Pretax and Aftertax Returns to Capital—Economy-Wide and for Private Business

1 Net capital income from Table 6.2:4 divided by the total capital stock from Table 4.3:18 in Gary Robbins and Aldona Robbins, "Eating Out Our Substance: How Taxation Affects Saving," Lewisville, TX: TaxAction Analysis, *Policy Report* No. 131, August 1995.

[2] From Table 6.2:10

[3] Fiscal Associates Tax Model

[4] Net capital income from Table 6.2:5 divided by the total capital stock from Table 4.3:19

[5] Table 6.2:11

Pretax and Aftertax Returns to Capital						
Year	Economy-wide Capital			Private Business Capital		
	Pretax Return[1]	Aftertax Return		Pretax Return[4]	Aftertax Return	
		Average[2]	Marginal[3]		Average[5]	Marginal[3]
1954	9.12%	5.69%	3.43%	13.81%	8.20%	3.91%
1955	9.02%	5.27%	3.96%	14.19%	8.00%	4.65%
1956	8.81%	5.15%	3.39%	13.00%	6.99%	3.83%
1957	7.33%	3.82%	3.19%	11.99%	6.23%	3.54%
1958	8.55%	5.36%	2.93%	13.29%	8.12%	3.14%
1959	7.46%	4.01%	3.32%	12.47%	6.79%	3.66%
1960	7.67%	4.27%	2.93%	11.73%	6.14%	3.08%
1961	8.71%	5.26%	2.97%	13.17%	7.49%	3.11%
1962	8.25%	4.76%	3.44%	13.09%	7.33%	3.76%
1963	8.92%	5.33%	3.57%	14.11%	8.17%	3.92%
1964	9.12%	5.52%	4.13%	14.25%	8.39%	4.78%
1965	9.26%	5.51%	4.61%	14.85%	8.77%	5.48%
1966	9.93%	6.16%	4.71%	15.39%	9.30%	5.59%
1967	9.73%	6.07%	4.19%	15.13%	9.32%	4.80%
1968	9.50%	5.63%	3.47%	14.13%	7.96%	3.77%
1969	8.70%	4.92%	2.88%	12.61%	6.70%	2.95%
1970	8.31%	4.91%	2.75%	12.02%	6.88%	2.77%
1971	8.36%	4.89%	3.22%	12.69%	7.53%	3.41%
1972	9.94%	6.34%	3.42%	14.20%	8.84%	3.67%
1973	10.61%	7.07%	3.57%	14.84%	9.58%	3.90%
1974	8.87%	5.60%	2.90%	11.93%	7.09%	3.01%
1975	7.84%	4.89%	2.95%	11.95%	7.61%	3.15%
1976	9.56%	6.43%	3.16%	13.98%	9.32%	3.46%
1977	9.21%	6.03%	3.35%	13.39%	8.61%	3.76%
1978	10.03%	7.00%	3.47%	14.01%	9.39%	3.91%
1979	10.15%	7.35%	3.59%	13.34%	9.03%	4.11%
1980	8.97%	6.41%	2.83%	11.41%	7.48%	2.99%
1981	6.44%	4.02%	2.92%	8.85%	5.15%	3.11%
1982	6.35%	4.17%	2.74%	8.24%	4.99%	2.86%
1983	7.36%	5.11%	2.51%	10.39%	7.01%	2.53%
1984	7.65%	5.27%	3.42%	9.88%	6.24%	3.83%
1985	7.88%	5.46%	3.26%	10.51%	6.78%	3.61%
1986	7.86%	5.32%	2.83%	11.44%	7.50%	3.00%
1987	8.31%	5.51%	2.80%	11.94%	7.51%	2.97%
1988	8.25%	5.42%	3.49%	11.56%	7.05%	4.00%
1989	8.44%	5.57%	3.56%	11.89%	7.33%	4.13%
1990	7.39%	4.58%	3.38%	10.96%	6.55%	3.90%
1991	6.46%	3.70%	3.11%	9.98%	5.66%	3.50%
1992	7.09%	4.24%	3.29%	10.69%	6.21%	3.78%
1993	7.80%	4.78%	3.07%	11.17%	6.38%	3.43%
1994	7.41%	4.23%	3.15%	10.86%	5.79%	3.54%
Mean	**8.45%**	**5.29%**	**3.31%**	**12.42%**	**7.45%**	**3.67%**
Std. Dev.	**1.04%**	**0.87%**	**0.47%**	**1.70%**	**1.18%**	**0.67%**

Evidence from 1954 to 1994

Using the method outlined above we have calculated the marginal real aftertax rate of return on a new investment for the United States. Because of the complexity and variability in depreciation and tax laws, we build up the economy-wide marginal return from the following twelve representative assets by category and form of ownership:[16]

Corporate Sector	Noncorporate Sector	Owner-occupied Housing
Equipment	Equipment	
Nonresidential Structures	Nonresidential Structures	
Inventories	Inventories	
Residential Structures	Residential Structures	Residential Structures
Land	Land	Land

We find that the marginal real aftertax return to capital is remarkably stable. From 1954 through 1994, the marginal return averaged 3.4 percent annually. And, 95 percent of time, it ranged between 2.5 percent and 4.3 percent.[17] [See Figure 4.]

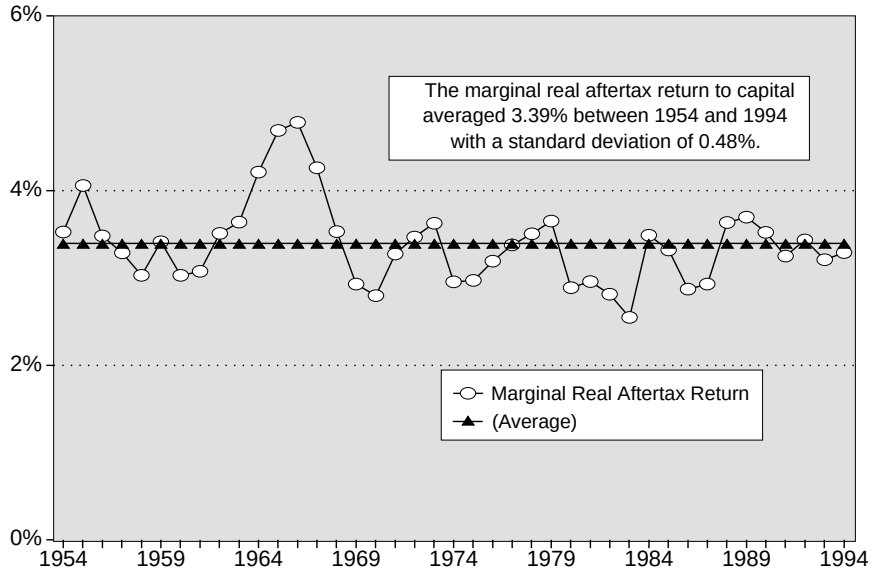


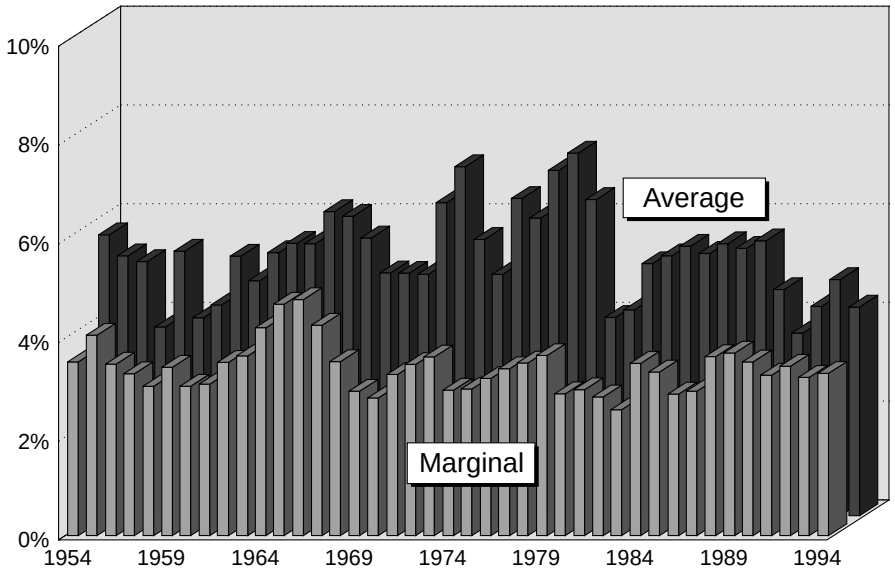
Figure 4

Real Aftertax Rate of Return to Capital on a New Investment

Because of differences in tax and depreciation adjustments, the marginal real aftertax return to capital is lower than the average. On average, investors received a real aftertax return of $423 on $10,000 of investment in 1994. However, the return on an *additional* $10,000 investment was only $315. [See Table 2 and Figure 5.]

Figure 5

Marginal & Average Aftertax Returns to Capital



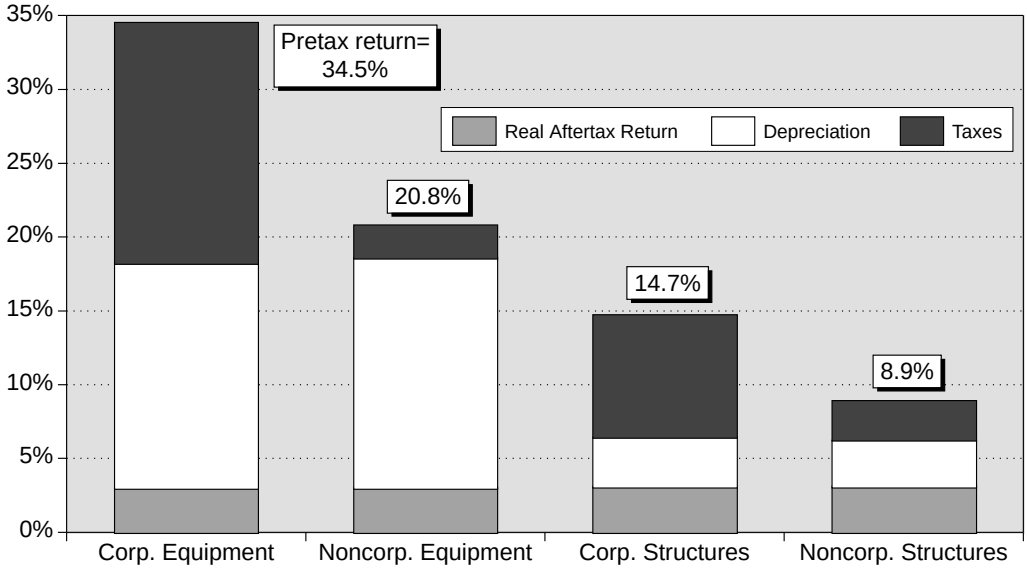
Relative Importance of Taxes and Depreciation

How much do depreciation and taxes add to the return that capital must earn to satisfy investors? The answer varies from asset to asset. First, there is a tremendous variation in pretax returns. For example, in 1994, the pretax return on corporate equipment was 34.5 percent, while corporate structures returned only 14.7 percent. For the noncorporate sector, equipment returned 20.8 percent before tax while structures earned 8.9 percent. The major reasons for these differences trace back to differences in productive lives of assets and tax laws. [See Tables 3 and 4.]

For both corporate and noncorporate equipment, which have an average productive life of seven years, depreciation accounted for roughly 45 percent of the pretax return in 1994. Taxes accounted for another 45 percent. That left about 10 percent of the return for investors. [See Figure 6.]

Figure 6

Components of the Pretax Return for Four Types of Assets



Depreciation was far less important for longer-lived structures, leading to much lower pretax returns in both the corporate and noncorporate sector. Taxes, however, again were a significant factor, accounting for 56 percent of the corporate pretax return and 30 percent of the noncorporate return.

Composition of the Pretax Return to Capital:										
Year	Corporate Equipment					Corporate Structures				
	Pretax Return[1]	Contribution of:				Pretax Return[1]	Contribution of:			
		Aftertax Return	Depre-ciation[2]	Wealth Taxes[3]	Income Taxes[4]		Aftertax Return	Depre-ciation[2]	Wealth Taxes[3]	Income Taxes[4]
1954	34.1%	10.1%	35.9%	3.7%	50.3%	16.9%	20.3%	20.2%	7.5%	52.1%
1955	34.8%	11.4%	35.4%	3.6%	49.6%	17.8%	22.3%	19.3%	7.0%	51.4%
1956	34.6%	9.8%	35.8%	3.7%	50.7%	16.9%	20.0%	20.3%	7.6%	52.0%
1957	34.9%	9.1%	35.3%	3.8%	51.7%	16.9%	18.8%	20.3%	7.8%	53.0%
1958	35.6%	8.2%	34.4%	3.8%	53.5%	17.1%	17.1%	20.1%	8.0%	54.8%
1959	35.3%	9.4%	34.8%	4.0%	51.8%	17.4%	19.0%	19.8%	8.0%	53.2%
1960	35.6%	8.2%	34.7%	4.2%	52.9%	17.1%	17.1%	20.1%	8.7%	54.1%
1961	36.6%	8.1%	33.8%	4.3%	53.8%	17.7%	16.7%	19.5%	8.9%	54.9%
1962	34.6%	9.9%	35.9%	4.6%	49.5%	18.3%	18.8%	18.8%	8.7%	53.7%
1963	34.8%	10.3%	36.0%	4.6%	49.1%	18.5%	19.3%	18.6%	8.7%	53.4%
1964	32.3%	12.8%	39.0%	5.1%	43.1%	18.4%	22.5%	18.8%	9.0%	49.7%
1965	32.4%	14.2%	39.2%	5.1%	41.5%	18.8%	24.6%	18.3%	8.8%	48.3%
1966	33.0%	14.3%	38.7%	4.8%	42.2%	19.2%	24.6%	18.0%	8.3%	49.2%
1967	33.4%	12.6%	38.2%	4.8%	44.4%	18.9%	22.2%	18.2%	8.5%	51.1%
1968	36.5%	9.5%	35.1%	4.4%	50.9%	19.6%	17.7%	17.5%	8.2%	56.6%
1969	36.7%	7.8%	35.3%	4.4%	52.5%	18.8%	15.3%	18.2%	8.5%	57.9%
1970	34.1%	8.0%	38.0%	4.8%	49.2%	17.3%	15.9%	19.8%	9.5%	54.9%
1971	32.6%	9.9%	39.7%	5.1%	45.3%	17.6%	18.3%	19.3%	9.5%	52.9%
1972	33.0%	10.4%	39.6%	5.1%	45.0%	17.9%	19.0%	18.9%	9.3%	52.7%
1973	32.4%	11.0%	40.9%	4.8%	43.3%	17.6%	20.3%	19.3%	8.9%	51.5%
1974	31.0%	9.4%	42.9%	4.5%	43.2%	16.0%	18.1%	21.1%	8.8%	52.0%
1975	31.3%	9.4%	42.3%	4.3%	44.0%	16.3%	18.0%	20.6%	8.2%	53.1%
1976	31.2%	10.1%	42.4%	4.2%	43.2%	16.6%	19.0%	20.3%	8.0%	52.8%
1977	31.2%	10.7%	42.6%	4.2%	42.5%	16.8%	20.0%	20.1%	7.8%	52.1%
1978	30.9%	11.2%	43.5%	3.7%	41.6%	16.5%	21.0%	20.5%	6.8%	51.7%
1979	27.6%	13.0%	48.9%	3.5%	34.6%	15.2%	23.6%	22.2%	6.4%	47.9%
1980	28.4%	10.0%	47.2%	3.2%	39.6%	14.9%	19.0%	22.8%	6.1%	52.1%
1981	29.3%	10.0%	45.6%	3.1%	41.4%	14.2%	20.6%	24.0%	6.3%	49.1%
1982	26.6%	10.3%	50.2%	3.5%	36.0%	13.4%	20.5%	25.5%	6.9%	47.1%
1983	32.8%	7.6%	40.9%	2.8%	48.7%	15.4%	16.3%	22.1%	6.0%	55.6%
1984	29.0%	11.8%	46.8%	3.2%	38.2%	15.1%	22.6%	22.6%	6.2%	48.7%
1985	30.8%	10.6%	44.9%	3.1%	41.5%	15.7%	20.8%	21.7%	6.1%	51.4%
1986	34.1%	8.3%	41.1%	2.9%	47.7%	17.1%	16.5%	19.8%	5.7%	58.0%
1987	36.8%	7.6%	38.4%	2.7%	51.3%	16.0%	17.6%	21.2%	6.2%	55.1%
1988	32.7%	10.7%	43.7%	3.0%	42.6%	14.9%	23.4%	22.5%	6.5%	47.5%
1989	33.1%	10.7%	43.4%	3.1%	42.8%	15.0%	23.6%	22.3%	6.8%	47.3%
1990	32.5%	10.4%	44.4%	3.3%	41.9%	14.6%	23.2%	23.0%	7.3%	46.6%
1991	32.5%	9.6%	44.4%	3.4%	42.6%	14.2%	21.8%	23.5%	7.7%	47.0%
1992	32.5%	10.1%	44.7%	3.5%	41.7%	14.4%	22.8%	23.1%	7.8%	46.2%
1993	34.5%	8.9%	42.9%	3.3%	44.9%	14.8%	20.8%	22.5%	7.6%	49.1%
1994	34.5%	9.1%	43.9%	3.2%	43.7%	14.7%	21.4%	22.5%	7.6%	48.5%
1995	35.0%	8.8%	44.0%	3.2%	44.0%	14.6%	21.2%	22.6%	7.6%	48.6%

Table 3

Composition of the Pretax Return to Capital: Corporate Equipment & Structures

1 The pretax return is the service price for each asset. Appendix B describes the service price calculation.

2 Depreciation is the decline in value of the asset over its productive life.

3 Wealth taxes are property and estate taxes.

4 Income taxes include personal and corporate income taxes.

Table 4

Composition of the Pretax Return to Capital: Noncorporate Equipment & Structures

1 The pretax return is the service price for each asset. Appendix B describes the service price calculation.

[2] Depreciation is the decline in value of the asset over its productive life.

[3] Wealth taxes are property and estate taxes.

[4] Income taxes include personal and corporate income taxes.

Composition of the Pretax Return to Capital:										
Year	Noncorporate Equipment					Noncorporate Structures				
	Pretax Return[1]	Contribution of:				Pretax Return[1]	Contribution of:			
		Aftertax Return	Depre-ciation[2]	Wealth Taxes[3]	Income Taxes[4]		Aftertax Return	Depre-ciation[2]	Wealth Taxes[3]	Income Taxes[4]
1954	18.9%	18.1%	68.8%	6.7%	6.4%	8.9%	38.4%	34.5%	14.1%	13.1%
1955	19.5%	20.3%	67.0%	6.4%	6.2%	9.5%	41.7%	32.5%	13.2%	12.7%
1956	19.0%	17.8%	68.8%	6.8%	6.6%	8.9%	38.0%	34.9%	14.4%	12.7%
1957	19.1%	16.7%	68.5%	7.0%	7.8%	8.9%	35.9%	35.1%	14.9%	14.1%
1958	18.8%	15.6%	69.1%	7.3%	8.1%	8.7%	33.6%	36.0%	15.7%	14.8%
1959	19.3%	17.2%	67.1%	7.2%	8.5%	9.2%	35.9%	33.9%	15.1%	15.2%
1960	19.0%	15.4%	68.2%	7.8%	8.6%	8.9%	32.8%	35.1%	16.7%	15.4%
1961	19.2%	15.5%	67.6%	8.2%	8.8%	9.1%	32.5%	34.3%	17.2%	16.0%
1962	18.6%	18.5%	70.3%	8.6%	2.6%	9.6%	36.0%	32.8%	16.8%	14.4%
1963	18.6%	19.2%	70.8%	8.7%	1.3%	9.6%	37.2%	32.7%	16.8%	13.3%
1964	18.7%	22.1%	70.7%	8.8%	-1.6%	10.2%	40.7%	30.9%	16.3%	12.2%
1965	19.3%	23.9%	69.3%	8.5%	-1.6%	10.7%	43.2%	29.4%	15.4%	12.0%
1966	19.7%	23.9%	68.8%	8.1%	-0.8%	10.9%	43.2%	28.8%	14.6%	13.4%
1967	19.4%	21.6%	70.3%	8.3%	-0.2%	10.5%	40.0%	29.9%	15.3%	14.8%
1968	19.0%	18.3%	72.3%	8.5%	0.9%	9.9%	35.0%	31.6%	16.3%	17.1%
1969	18.6%	15.4%	74.1%	8.6%	1.8%	9.3%	30.7%	33.4%	17.2%	18.7%
1970	18.6%	14.7%	74.1%	8.8%	2.4%	9.2%	29.9%	33.9%	17.8%	18.4%
1971	18.7%	17.2%	73.5%	9.0%	0.2%	9.8%	32.8%	31.6%	17.1%	18.5%
1972	18.9%	18.1%	73.1%	8.8%	-0.1%	10.1%	33.9%	30.7%	16.5%	18.9%
1973	19.1%	18.7%	72.9%	8.2%	0.3%	10.2%	35.0%	30.3%	15.3%	19.4%
1974	18.5%	15.6%	75.3%	7.6%	1.5%	9.4%	30.7%	32.6%	14.9%	21.8%
1975	17.8%	16.5%	77.8%	7.5%	-1.9%	9.3%	31.5%	32.9%	14.4%	21.2%
1976	17.8%	17.7%	77.6%	7.4%	-2.8%	9.5%	33.2%	32.2%	13.9%	20.8%
1977	18.0%	18.6%	77.6%	7.3%	-3.5%	9.6%	34.7%	31.8%	13.6%	19.8%
1978	18.1%	19.2%	77.7%	6.2%	-3.1%	9.6%	36.0%	31.9%	11.7%	20.5%
1979	18.3%	19.6%	77.1%	5.3%	-2.0%	9.5%	37.7%	32.3%	10.3%	19.7%
1980	17.8%	15.9%	78.8%	5.1%	0.2%	8.8%	31.9%	34.9%	10.3%	22.9%
1981	17.2%	17.0%	80.9%	5.2%	-3.1%	8.2%	35.7%	38.0%	11.0%	15.3%
1982	17.1%	16.0%	80.8%	5.4%	-2.2%	8.0%	34.3%	39.2%	11.6%	15.0%
1983	16.8%	14.9%	82.1%	5.5%	-2.4%	7.9%	31.6%	39.6%	11.6%	17.2%
1984	17.8%	19.2%	78.3%	5.2%	-2.7%	9.0%	38.0%	34.9%	10.4%	16.6%
1985	17.6%	18.5%	80.0%	5.4%	-3.9%	8.7%	37.5%	36.1%	10.9%	15.5%
1986	17.3%	16.3%	82.2%	5.6%	-4.2%	8.6%	33.0%	36.6%	11.3%	19.1%
1987	19.6%	14.3%	73.3%	5.0%	7.3%	8.6%	32.5%	36.3%	11.4%	19.8%
1988	20.2%	17.3%	71.8%	4.8%	6.1%	9.1%	38.5%	34.3%	10.8%	16.4%
1989	20.4%	17.4%	71.6%	5.0%	6.0%	9.2%	38.8%	33.9%	11.2%	16.1%
1990	20.3%	16.6%	72.2%	5.2%	5.9%	9.0%	37.5%	34.4%	11.8%	16.2%
1991	20.1%	15.5%	73.4%	5.5%	5.7%	8.7%	35.5%	35.4%	12.5%	16.6%
1992	20.2%	16.3%	73.3%	5.6%	4.9%	8.9%	37.1%	34.8%	12.7%	15.4%
1993	20.3%	15.1%	74.2%	5.6%	5.1%	8.8%	34.8%	34.9%	12.8%	17.4%
1994	20.8%	15.1%	74.2%	5.4%	5.3%	8.9%	35.4%	34.4%	12.6%	17.6%
1995	21.1%	14.7%	74.6%	5.3%	5.4%	8.8%	35.1%	34.7%	12.6%	17.5%

Investment, Taxes and the Return to Capital

In the previous study, we found that the rate of private saving and its *average* aftertax return moved together over the last four decades. [See Figure 7.] How does the *marginal* aftertax return to capital relate to investment?

To measure the rate of investment, we use the percent change in the stock of U.S. business capital excluding land. As with private saving, we find that the change in investment also moved closely with the marginal real aftertax rate of return to capital between 1954 and 1994. We now focus on specific periods to show the high degree of correlation between business capital formation, its marginal aftertax return and changing tax policy.[18]

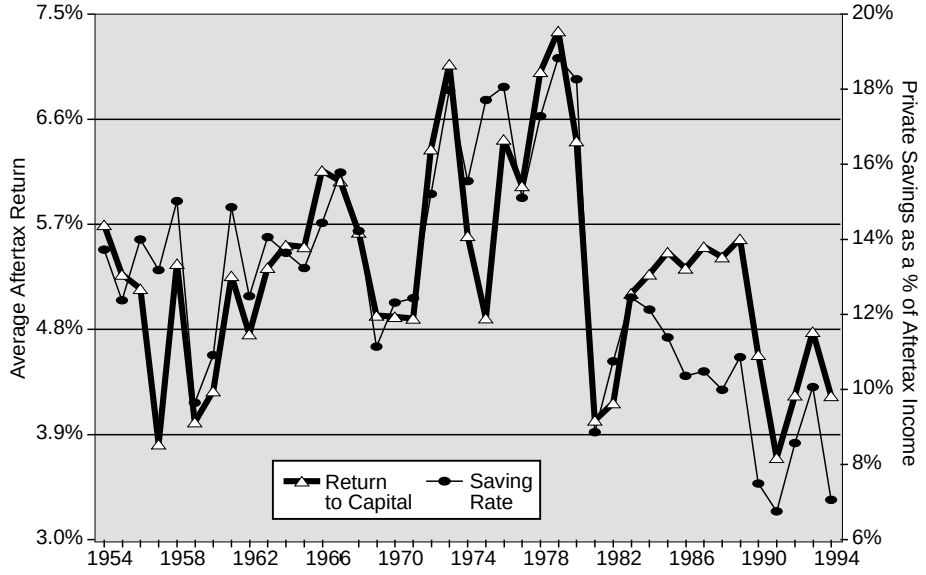


Figure 7

Private Saving Rate and the Average Aftertax Return to Capital

Source: Gary Robbins and Aldona Robbins, "Eating Out Our Substance: How Taxation Affects Saving," Lewisville, TX: TaxAction Analysis, Policy Report No. 131, August 1995

The 1960s

The Kennedy tax cuts of the 1960s significantly lowered taxes on capital. In 1962, business taxes were lowered through an investment tax credit and revision of an outmoded tax depreciation schedule.[19] Individual rate reductions in 1964 further reduced taxes on capital. A rapid build-up of capital followed in response to the increased aftertax return. [Figure 8.]

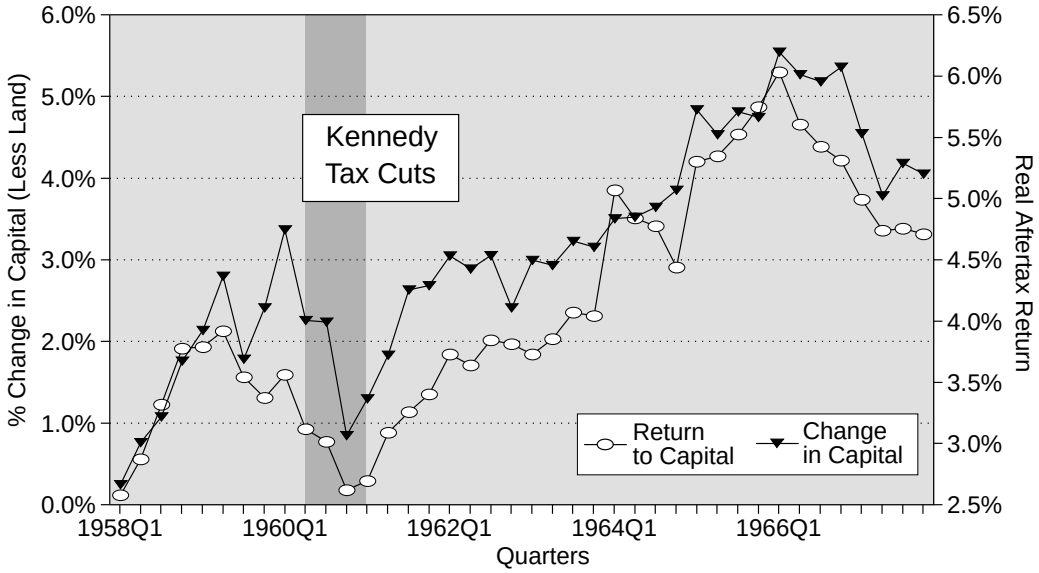


Figure 8

Real Aftertax Return & Change in Business Capital: The 1960s

Shaded area denotes recession.

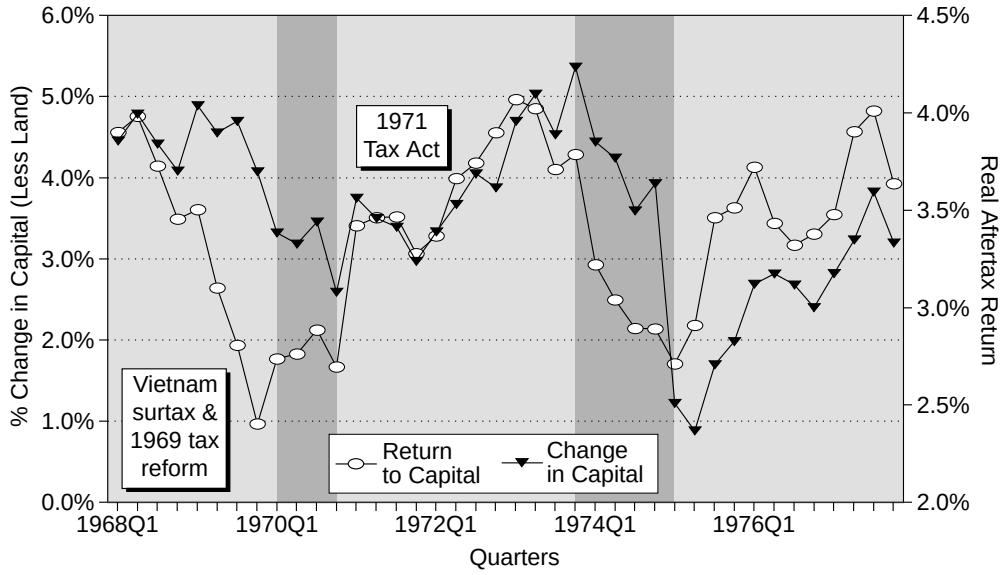
The 1970s

Investment during the 1970s was more volatile. The marginal aftertax return to capital fell because of the Vietnam War surtaxes and the Tax Reform Act of 1969, which raised tax rates and treated capital more harshly.[20] As the aftertax return fell, so did investment. The rate of return to capital began to rise again, as did investment, after the enactment of tax relief in 1971.[21] However, oil shocks and the 1973-74 recession led to a steep decline in both the return to capital and investment. Both began to recover as the recession ended.[22] [See Figure 9.]

Figure 9

Real Aftertax Return & Change in Business Capital: The 1970s

Shaded area denotes recession.



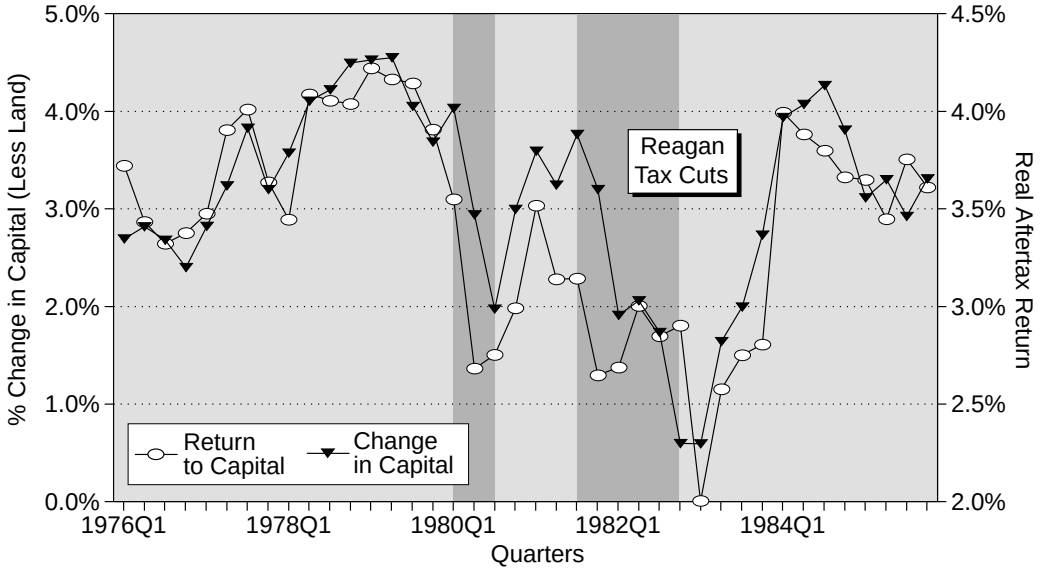
The 1980s

Volatility continued into the 1980s. After dropping due to the stagflation of the late 1970s and almost back-to-back recessions in 1980 and 1981-82, the aftertax return to capital began rising after the Reagan tax cuts. Individual income tax rates were lowered by 25 percent, and business taxes were to be reduced through a revamping of the depreciation schedule. However, concern over deficits subsequently resulted in repeal of two-thirds of the business tax cuts, causing a decrease in the aftertax return.[23] [See Figure 10.]

Figure 10

Real Aftertax Return & Change in Business Capital: The 1980s

Shaded area denotes recession.



Recent Trends

Aftertax returns and investment have been trending downward since the late 1980s. The Tax Reform Act of 1986, which raised taxes on business to pay for the individual rate cuts, was followed by rate increases in 1990 and 1993.[24] This higher tax environment and the 1990-91 recession has caused the aftertax return to capital and investment to remain below levels achieved in the 1980s. [See Figure 11.]

"Aftertax returns and investment have been trending downward since the late 1980s."

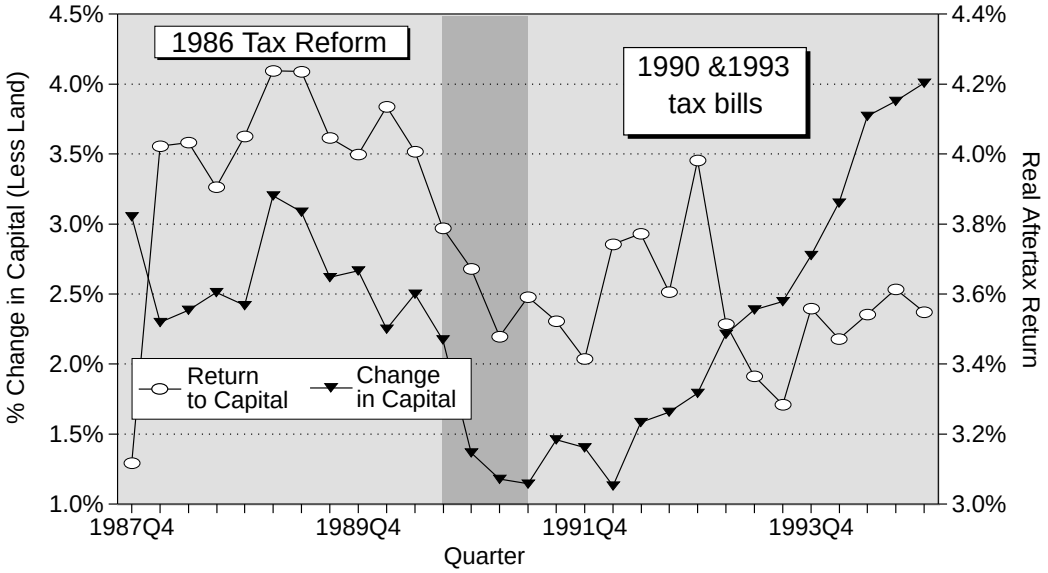


Figure 11

Real Aftertax Return & Change in Business Capital: Recent Trends

Shaded area denotes recession.

To summarize, over the last four decades, changes in the aftertax rate of return to capital, largely resulting from changes in tax policy, have been followed by changes in investment. Specifically, an increase in the aftertax return led to an increase in the rate of capital formation. Absent another shock, investment continued to increase until the aftertax return was driven back down to its long-run, economy-wide average of 3.4 percent. Conversely, a decrease in the aftertax return was followed by a decrease in investment until the aftertax return was driven back up to 3.4 percent. Moreover, the adjustments to the stock of capital in either direction occurred fairly rapidly, generally taking five years or less.

Implications and Limitations of the Results

These results have clear implications for tax policy and the tax reform debate. Decreases in taxes on capital temporarily raise the aftertax return, inducing investors to step up the amount of investment they wish to undertake. More investment leads to a faster rate of capital formation, reducing the pretax return. The increase in investment continues until the aftertax return is back at its equilibrium level. The reverse process occurs when taxes on capital are increased. Adjustments in either direction usually occur within five years.

"This evidence that taxes on capital do affect the amount of investment contradicts the basic premise underlying government revenue estimates"

This evidence that taxes on capital do affect the amount of investment contradicts the basic premise underlying government revenue estimates: that total economic activity remains the same whether taxes are raised, lowered or are unchanged.[25] The results of this study suggest that decreasing taxes on capital may produce enough positive economic effects to offset most or all of the *static* revenue loss. Similarly, an increase in taxes on capital will yield far less revenue than expected.

Although these results show the direction, they, by themselves, do not provide enough information to gauge the size of revenue effects associated with tax policy changes. Still missing is the role played by other components of saving and investment, specifically government surpluses or deficits and net foreign investment. Once these links are complete (the subject of a later study) it will be 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

The economy-wide aftertax return on new investment has been remarkably stable over the last four decades. Disturbances in this return due to changes in tax policy have been quickly countered through changes in investment to bring the return back to its long-run value of 3.4 percent. Tax bills that increased taxes on capital were followed by a slowdown in investment while bills that decreased taxes on capital led to a faster rate of capital formation.

Just as in the past, failure to recognize this relationship between taxes on capital and investment in the current tax reform debate will produce unintended consequences for the economy and budget.

Appendix A: Determinants of the Investment Decision[26]

The decision to invest in capital is complex because the use of capital services and their return generally span more than one period. Analysis requires a method that translates a pattern of investment return over many periods into current-period equivalents. This translation falls under the general rubric of the *service price.*

The analysis presented below examines the financial investment decision in detail. It begins with the most simple and progresses to the purchase of a real capital asset, developing a set of principles in the process.

Financial Assets and the Investment Decision: Derivation of the Debt Service Price

A. Consol with perfect foresight

Zero inflation, no tax

A consol is an asset which yields an infinitely-lived, constant stream of earnings. At the margin, the net payment per period from the consol divided by its purchase price equals the *rate of return* for both the investor and the market. This market return is the rate of exchange between current and future consumption for the individual and for the market.

Knowing two of the three elements of the transaction uniquely determines the third. For example, to induce an investor with a market return of 4 percent to purchase a consol of $1,000, the net payment, or debt service, per period must be $40. The formula for the debt service in the case of a simple consol is written as:

(1) Consol Debt Service = $ 1 * r

where r is the market return.

To avoid unnecessary complications, the remaining analysis assumes that the market return remains constant through time. Also, the formulas use continuous compounding and the purchase price of the assets is one dollar.

Inflation, no tax

Because inflation changes the value of the goods that can be purchased with the proceeds from the consol, future net payments must be adjusted for changes in purchasing power. For example, annual inflation of 5 percent (forever) would reduce the value of all future payments and, therefore, the principal from any subsequent sale by 5 percent each year. To hold the investor harmless would require increasing the debt service payment in the previous example from $40 per period to $90. The debt service formula which incorporates this inflation premium becomes:

(2) Consol with Inflation Debt Service = $ 1 * (r + z)

where z is the expected inflation rate.

Inflation and a tax

The presence of a tax directly reduces the net payment received by the investor, requiring a higher pretax payment to keep the investor as well off as before. Assuming a 50 percent tax rate, half of the proceeds of each payment would go to the taxing authority. From our above example, the payment amount would have to double from $90 to $180 per period, modifying the debt service formula to:

(3) Consol with Inflation & Tax Debt Service = $ 1 * (r + z)/(1 - t)

where *t* is the expected marginal tax rate.

Both the market return and the inflation rate must be divided by one minus the tax rate to *gross up* the aftertax amounts to necessary pretax amounts. The term "gross-up" is used in the remainder of the paper to indicate this translation.

Note that the tax is levied on the inflation premium as well as the pure interest element of the consol. This phenomenon, known as the Fisher effect, explains an important interaction between taxes, inflation, and the interest rate. As either taxes or inflation increase, the nominal interest rate must increase at a faster pace than the simple sum of the previous two rates.

B. Purchase of a bond with perfect foresight

The previous analysis can easily be extended from an infinite payment stream to one with a fixed time horizon and repayment of principal, commonly known as a *bond*. In this case, the previous examples can be thought of as the equivalent of two simple transactions: (a) purchase of the consol, and (b) subsequent sale at a price agreed to at the time of purchase.

Under conditions of constant inflation and market return, the geometry of bond analysis is identical to that of the consol. Varying either the inflation rate or market return will complicate the problem but not materially change the conclusions. The resulting formula for a bond's debt service is:

(4) Bond Debt Service = $ 1 * (1 - $e^{-(r+z)*T}$)*((r + z)/(1 - $e^{-(r+z)*T}$))/(1 - t)

= $1 * (r + z)/(1 - t).

where T is the maturity date.

The payment amount necessary to attract the investor in this example is the original purchase price of the instrument less the inflation-adjusted, discounted value of the future return of principal. The term, *net-of-tax private present costs*, denotes the net present value of costs and repayments that are not directly related to the income stream of the asset. In this case, it is the original purchase price less the present value of the return of principal. This allows the analysis to concentrate separately on the two major aspects of the transaction—net acquisition-principal repayment and periodic income.

Valuation of the net-of-tax private present cost of the bond must be recovered over the term of the bond along with the net interest income required by the investor. The present value of the payment stream will be used to characterize both the level and pattern of the periodic income stream. The general formula for the debt service of an investment is the net-of-tax private present cost of the investment, (1 - $e^{-(r+z)*T}$), grossed-up for taxes, and divided by the present value of the payment stream, (1 - $e^{-(r+z)*T}$) / (r + z). This reduces to our previous example, and the debt service will be exactly as before, or $180 per period.

C. Purchase of a bond with risk

Up to this point we have assumed that the investor knows all current and future prices. However, this is not the way the real world operates. Rather, the investor and the market must make guesses about future prices and taxes. These guesses are incorporated into our analysis as "expected" inflation rates and "expected" tax rates.

Expectations are generally characterized by a mean, or average, and by a standard deviation, or likely variation of anticipated future prices. In a world of perfect knowledge, all the investor needs to know is the average inflation and tax rates because their standard deviations would be zero.

Short of perfection, the investor must include a *risk premium* to cover the costs of making a wrong guess. This risk premium is directly related to the perceived standard deviation of future prices. However, there is no guarantee that the guess will be right. As a result, misguesses about risk and future inflation can lead to periods—even long ones—of apparent negative returns.

The formula has to include a term reflecting the risk of misguessing inflation. This taxable risk premium must be added to the market return and inflation term. For example, a risk premium of 2 percentage points increases the translation factor from 18 percent to 22 percent after tax, and the debt service stream increases from $180 to $220. Note that the Fisher effect directly extends to risk premiums as well as to inflation rates, and the debt service formula becomes:

(5) Bond with Risk Debt Service = $ 1 * (r + z + risk)/(1 - t)

where risk is the expected loss or risk.

D. Choice between bonds with differing risk

Assuming that investors will always choose those investments they believe will yield the greatest net return extends the analytic framework to a wider application. Because the market return and price forecast must be identical for each investment alternative considered, the investor will always choose the one which yields the higher net return. At equilibrium, the aftertax, net-of-risk rates of return must be equal between every paired alternative and for all investments. If the returns are not equal, an arbitrage situation will exist which will be exploited by "selling" the asset with the lower return and "buying" the one with the higher return until the two expected returns are identical. In other words, market equilibrium requires that each asset compete with every other.

Arbitrage in a rational market means that the relevant market for determining prices or rates of return for financial instruments must include the entire set of instruments available or known to the population of investors. The degree of interdependence necessary to assure this result is surprisingly small, merely that at least one investor know that the opportunity exists. This is because one investor can buy and sell enough of the two disparate issues to drive their prices into line. Those who argue a persistent divergence must also argue that they themselves are irrational since they forego the opportunity to make certain and instant profits from the knowledge they profess to have. It seems more realistic to proceed on the premise that the market will yield equal expected, risk-adjusted, aftertax returns for all the paired choices available. New issues must compete with other new issues as well as all pre-existing issues. The relevant market for rate determination is the entire portfolio of choices available to investors, and the market supply, therefore, is the stock of assets not simply the flow of new issues.

E. International choice; the exchange rate

Extension of this analysis to investment across borders requires only that the price expectation process include the movements of more than one currency. As previously found, the investor must make some judgment about the value of future financial flows in order to chose among alternate investments. The denomination of the terms of the instrument may dictate that two translations be made before the transaction can be evaluated in terms of real goods or services.

The exchange rate is a simple, shorthand characterization of this dual forecasting problem. As in the previous example, the investor must convert all future payments into his current unit of account. This requires both a forecast of likely future prices

in his domestic currency and the likely exchange rate between his currency and that in which the instrument is paid. As before, because these forecasts must be made in the face of uncertainty, they must include and provide explicit accounting for the likelihood of loss through the inclusion of risk premiums, or:

(6) Foreign Bond Debt Service = $ 1 * (r + z + risk + diff)/(1 - t)

where diff is the expected differential inflation rates.

Because the typical investor does not possess the necessary information to make the exchange rate forecast, this is normally left to specialists who do little else. This fact does not diminish the degree of competition between instruments of different countries because competition only requires one person to arbitrage the market to a point where all issues compete with one another. In the final analysis, U.S. government issues compete with those of the Sony Corporation, etc. Although this competition requirement could be relaxed to allow small deviations, it would add nothing to the analysis of market tendencies except needless complication of the mathematics.

Real Assets and the Investment Decision: Derivation of a Capital Service Price

Analysis of investment in real assets becomes more complicated because of the problem of characterizing the productive life of a real asset. Complications also occur because of the more intricate tax treatment of capital assets and their returns, including property taxes, indirect business taxes, multiple levels of direct taxation, investment credits, and capital cost recovery systems.

For a particular real asset, one can calculate an implied rental rate, analogous to a bond's coupon rate, which equates the rate of compensation that would accrue to the owner if the asset's productive services were to be sold in a competitive rental market. These rentals would have to be at levels sufficient to cover both the anticipated taxes and expected decline in the asset's productive capability while maintaining a "normal" (risk-inclusive) rate of return. This rate of return, net of risk, is the same return as the market return in the prior examples. For a given tax regime and a known pattern of productive efficiency, these rentals may be summarized by a capital *service price*.

- Specifically, the service price represents the minimum current marginal value product that must be earned by an additional dollar's investment in the asset in order for that extra investment to be undertaken.

Usually derivation of the service price assumes that investors maximize their prospective wealth position. Investment in each alternate asset continues until further increments no longer yield an increase to expected wealth. This method results in an expression for the service price that relates the necessary pretax return to the required aftertax return, just as in the prior financial examples. As mentioned earlier, the service price must cover expected loss in the asset's value and yield the same net return as alternate investments.

Before deriving the service price, an important point regarding the use of debt financing must be addressed. Recall that the investor must measure the cost of the marginal dollar's worth of investment. That dollar may be obtained either through borrowing or through equity financing. However, there can be only one single cost of capital at equilibrium given the arbitrage requirement. If there were more than one, the investor would always choose the least cost method of financing. But because both means of financing are observed, the cost of debt and equity financing must be equal at the margin. Thus, the service price calculations described below are equally valid for a leveraged as well as an equity-financed investment.[27]

We have chosen to focus on equity financing due to the high degree of interaction between the terms of debt financing and the overall debt/equity ratio of a firm. In most cases, it is impossible to obtain sufficient data on borrowing terms to calculate the debt finanical version.

A. Constantly decaying asset with perfect foresight

As with financial assets, a simple investment can be used to introduce a framework for further analysis. An asset with a geometrically-declining pattern of output is analogous to the simple consol. In this case the investor must receive a service flow sufficient to cover his market return plus the decline in value of the asset each period. The formula for the service price in this simple case is:

(7) Capital Service Price = $1 * (r + d)

where d is the percentage decline in the value of the asset in terms of future output.

Inflation and a Sales Tax

Because the service price is in terms of units of real output, there is no change needed in the formula to incorporate inflation. The presence of a sales tax, however, reduces the net payment received by the investor. The service price formula in (7) must be grossed-up and becomes:

(8) Capital Service Price = $1 * (r + d)/(1 - ts)

where ts is the sales tax rate.

Risk can be incorporated at this point by defining r so that it contains both the market return and a risk premium.

Inflation and an Income Tax

An income tax introduces yet another term, *tax depreciation*, to the analysis. Unlike a financial asset, the principal of the investment in a real asset is not returned, and the income flow must be adjusted to incorporate the change in net worth for income tax purposes.

U.S. income tax laws measure income for tax purposes by subtracting an arbitrary *depreciation deduction* from the gross returns to capital which reduces the net-of-tax private present cost of the investment. Tax depreciation, in contrast with the decline in the real productivity of the asset, is a financial asset in that it is a financial allowance against taxes over some specified time. Thus, the depreciation term must be valued with an inflation term and within the context of the tax savings it yields the investor. For example, the capital service price of straight-line depreciation becomes:

(9a) Capital Service Price = $1 * [1 - ti*(1 - $e^{-(r+z)*T}$)/(r + z)] * [(r+d)/(1-ti)]

where T is the arbitrary tax life and ti is the income tax rate.

Using names and symbols to simplify, equation (9a) may be rewritten as

(9b) Capital Service Price = $1 * (1 - D)*[SP/(1 - t)]

where *D* is the present value of tax savings due to any schedule of depreciation deductions and *SP* is the service price of the asset disregarding taxes from equation (7).

Remember that each of these two shorthand terms represent more complex expressions containing r, the market return plus risk, and z, the expected inflation rate. Finally, each of the prior equations could be solved for r in terms of the existing

service price to yield the real aftertax rate of return to capital which is nothing more than the market return plus the risk of owning a real capital investment. The following analysis allows the description of technological factors and tax depreciation schedules to become extremely complex without obscuring the basic relationship between the service price and the real rate of return to capital.

Inflation, Income and Indirect Taxes

Completing the service price calculation used in this study requires several steps to incorporate all the major features of taxation. To simplify the analysis and emphasize the relative importance of the various taxes applied to the returns to real capital, the influence of income taxes is considered first in isolation, followed by indirect taxes.

The return to capital subject only to income tax can be expressed by subtracting the investment tax credit and the tax value of depreciation terms described above from the gross costs of the asset, or:[28]

(10a) Capital Service Price = $1*(1 - itc - D) * SP / (1 - ti)

where *itc* is the investment tax credit rate, *D* is the present value of tax depreciation, *SP* is the service price of the asset disregarding taxes, and *ti* is the income tax rate.

Indirect taxes, such as property and sales taxes, also add to the tax wedge between pretax market returns and aftertax returns to investors in real assets. Returns to capital must be sufficient to pay these indirect taxes. To account for these costs, the rate of property taxation must be added to the service price expression described above, and the entire expression must be grossed-up to reflect taxes on the sales or production of final output. The entire formula for the service price becomes:

(10b) Capital Service Price = $ 1 * [tp + (1 - itc - td) * SP/(1 - t)] / (1 - ts)

where *tp* is property tax rate and *ts* is the sales tax rate.

Because property taxes at any point in time are levied on the aftertax, discounted present value of the remaining productive stream, it is as if the taxing authority adds a fixed percentage to the private cost of acquiring the asset. The sales tax takes a fixed percentage from the flow which services the investment. Thus, property taxes add directly to the cost of acquiring the asset, and the sales tax requires an additional gross-up factor.

Appendix B describes the method for calculating the service price.

Appendix B: Description of Service Price Calculations

We use the *service price*, described in Appendix A, to measure the cost of capital. To measure the alternate costs of capital implied by historical tax regimes we calculate a service price for each of 72 different asset categories covering 61 different industry classifications. [See Tables B-1 and B-2.] Because the tax rules governing various legal forms of organization are different, we separate the stocks of capital and service price calculations into corporate business, noncorporate business, owner-occupied housing, and other non-taxed activities (which to the analysis of tax consequences are ignored).

As Appendix A discusses, the translation of rates of return into service price for each asset category (and legal form) represent the current marginal products required per dollar of investment in that asset by each industry needed to yield a specific aftertax rate of return. They are the pretax rates of return that the asset must produce to order cover anticipated taxes, depreciation and a "normal" rate of return.

Economic Depreciation (replacement)

An asset category's rate of economic depreciation is assumed to be geometric. That is, the efficiency of the remaining stock of a particular asset decreases by a constant percentage. We use estimates of these rates of decline empirically derived by Hulten and Wycoff.[29] [Table B-3 contains the Hulten-Wycoff depreciation estimates.] We translate their 32 asset categories into our 72 categories for each of our 61 industrial sectors and 4 legal ownership forms. This process yields several thousand individual investment and capital stock series (out of a potential 17,568) from 1947 through 1994. These stocks serve as weights in the calculation of the economy-wide real aftertax return to capital.

Tax Depreciation

Allowable tax lives generally differ across industries, and allowable depreciation methods vary among the several alternate tax regimes in place in the U.S. during the period 1954 to 1995.These regimes include:

(1) Bulletin F Guideline Lives

(2) Class Lives, implemented in 1962

(3) Asset Depreciation Range (ADR), put in place in 1971

(4) Accelerated Cost Recovery System (ACRS) as originally passed in 1981 under ERTA and as modified in 1982, 1983, and 1984

(5) Modified Accelerated Cost Recovery System (MACRS) as passed in 1986, modified in 1993 and currently implemented.

We have collected the relevant IRS publications governing the tax depreciation lives from 1942 to the current time.[30] Bulletin F provided useful lives for about 5,000 different types of depreciable assets. Although subsequent IRS publications are more simplified, they still prescribe the tax lives of several thousand different types of assets. This tax life information has been translated into our industry and asset categories for each of the IRS publications.

The accounting methods used to calculate allowable depreciation for a given asset type and tax life also have changed over time. Passage of the Internal Revenue Act of 1954 explicitly provided for accelerated (200-percent-declining balance and sum-of-the-years digits) tax depreciation methods. The Tax Reform Act of 1969 limited tax depreciation to 150-percent-declining balance for nonresidential

structures. ACRS and MACRS prescribed the write-off schedules rather than allowing taxpayers to calculate the depreciation schedule independently. We have incorporated these changes into the calculation of the value of tax depreciation.

To incorporate tax depreciation into our framework we discount future deductions to the time the investment is made. The discounted value of the deductions times the tax rate can be thought of as an instantaneous reduction in the purchase price of the asset.

Discounting requires information on the market rate of interest for a large number of loans of differing maturities at each investment period (or *yield curve*). We have used Treasury Department information on the yield of government bonds of various fixed maturities to interpolate and extrapolate quarterly yield curves from 1954 to the present. A companion yield curve is constructed for Moody's BAA corporate bond series which is consistent with the yield differential between the long-end government bond and the BAA bond rate. This constructed series measures the market terms of loans of any maturity at each point in time.

The discounted value of the depreciation deduction is calculated as the sum of the discounted loans equal to the tax depreciation amounts over the entire tax life of each asset. The result is then subtracted from the amount that the investor must pay for a new investment in that asset. Note that this procedure does not require any information about expected inflation but relies solely on the observation that an investor could have obtained the loans at the market interest rate.

Investment Tax Credit (ITC)

An adjustment also must be made for the value of periodic investment tax credits. The original ITC, put in place in 1962, required that investors reduce the *basis*, or the amount eligible for tax depreciation, by the amount of the credit. We account for the credit by incorporating both the effective credit rate for each asset and the required basis adjustment. The credit is treated just as the tax depreciation deduction, that is, as a reduction in the original purchase price of the investment. The ITC was eliminated as part of the Tax Reform Act of 1986.

Marginal Tax Rates

Appropriate marginal tax rates also must be constructed for each type of income. The marginal corporate tax rate is the federal statutory maximum rate and the state and local rate, which is based on the ratio of total federal to state and local corporate tax revenues. The property tax rate is calculated as the average rate on all business assets, or total business property tax revenue over total value of business assets. The estate and gift tax rate is calculated in the same way except no distinction is made between business and owner-occupied housing assets. Thus the estate tax rate is the average across all private assets.

Marginal tax rates at the personal income tax level are constructed from annual IRS information on the distribution of income items and taxes for 1954 through 1992. The series provides detailed information on adjusted gross income (AGI), wages and salaries, dividends, capital gains, business income, and so forth for 39 income and tax filing status categories. We have extrapolated these data for 1993 and beyond. Weighted average marginal and average tax rates have been calculated for major categories of income for each year. State and local marginal rates have been constructed by fixing the ratio of the marginal to the average tax rate at two-thirds the federal ratio.

The effective tax rate on corporate earnings through the personal income tax combines the effective marginal tax rate on dividends and on capital gains. Because corporations do not normally distribute all of their aftertax profits, we must infer a

tax rate on retained earnings. In theory, corporations retain earnings to expand operations and increase future profits, presumbably leading to an increase in value. We assume that earnings are retained until the present value of future earnings equals the present value of currently-distributed dividends. The future increase in value of the firm will be taxed at the capital gains rate. Thus, we have constructed the effective marginal tax rate on current corporate earnings as the marginal rate on dividends and capital gains weighted by the dividend-to-retained-earnings ratio at each period.

Interaction of Adjustments

There are significant interactions among various features of the tax system. First, in calculating the present value of depreciation deductions we must adjust market interest rates to reflect deductibility of interest payments on the assumed loans. This is done by multiplying the interest rate times one minus the marginal tax rate of the business or corporation. Second, property taxes are generally deductible against income taxes while estate and gift taxes are not. Third, state and local income taxes are deductible against federal income taxes. We take these interactions into account in our final service price relationships.

The Service Price Equations

The following are the six general service price relations for the corporate, noncorporate and owner-occupied housing investments:

(1) Depreciable owner-occupied housing property:

$$y_{hd}=[r+d+t_e+t_{ph}*(1-t_{pih})]$$

(2) Nondepreciable owner-occupied housing property:

$$y_{hn}=[r+t_e+t_{ph}*(1-t_{pih})]$$

(3) Depreciable private noncorporate business property:

$$y_{nd}=[(r+d)*(1-itc-t_b*ba*z)+t_e]/(1-t_b)+t_{pb}$$

(4) Nondepreciable private noncorporate business property:

$$y_{nn}=[r+t_e]/(1-t_b)+t_{pb}$$

(5) Depreciable private corporate business property:

$$y_{cd}=[(r+d)*(1-itc-t_c*(1-t_{pic})*ba*z)+t_e]/[(1-t_c)*(1-t_{pic})]+t_{pb}$$

(6) Nondepreciable private corporate business property:

$$y_{cn}=[r+t_e]/[(1-t_c)*(1-t_{pic})]+t_{pb}$$

where:

y_{hd} is the service price for depreciable owner-occupied housing property

r is the real aftertax rate of return

d is the depreciation rate

t_e is the estate and gift tax rate

t_{ph} is the property tax rate on owner-occupied housing property

t_{pih} is the marginal tax rate on the property tax deduction

y_{hn} is the service price for nondepreciable owner-occupied housing property

y_{nd} is the service price for depreciable private noncorporate business property

itc is the investment tax credit rate

t_b is the marginal tax rate on private noncorporate business income

ba is the percentage of original basis eligible for depreciation

z is the present value of depreciation deductions

t_{pb} is the property tax rate on private business property

y_{nn} is the service price for nondepreciable private noncorporate business property

y_{cd} is the service price for depreciable private corporate business property

t_c**is** the marginal corporate income tax rate

t_{pic} is the marginal personal income tax rate on corporate income

Table B-1

Type Of Asset

Type Of Asset	
1	Household Furniture and Fixtures
2	Other Furniture and Fixtures
3	Fabricated Metal Products
4	Steam Engines and Turbines
5	Internal Combustion Engines and Turbines
6	Farm Tractors
7	Construction Tractors
8	Agricultural Machinery
9	Construction Machinery
10	Mining and Oil field Machinery
11	Metal working Machinery
12	Special Industry Machinery
13	General Industrial
14	Office
15	Service Industry Machinery
16	Communication Equipment
17	Electrical Transmission
18	Household Appliances
19	Other Electrical Equipment
20	Trucks
21	Autos
22	Aircraft
23	Ships and Boats
24	Railroad Equipment
25	Scientific and Engineering Instruments
26	Photocopy and Related Equipment
27	Other Nonresidential Equipment
28	Industrial Buildings
29	Mobile Offices
30	Office Buildings
31	Commercial Warehouses
32	Other Commercial Buildings

Table B-1 (continued)

Type Of Asset

Type Of Asset	
33	Religious Buildings
34	Educational Buildings
35	Hospital and Institutional Buildings
36	Hotels and Motels
37	Amusement and Recreational Buildings
38	Other Nonfarm Buildings
39	Other Railroad Structures
41	Electric Light and Power Structures
42	Gas Structures
43	Local Transit Structures
44	Petroleum Pipelines
45	Farm Structures
46	Petroleum and Natural Gas Mining Exploration
47	Other Mining Exploration
48	Other Nonresidential Structures
49	Railroad Replacement Track
50	Nuclear Fuel
51	1-to-4-Unit New Farm Owner-Occupied Housing
52	1-to-4-Unit Additions and Alterations to Farm Owner-Occupied Housing
53	1-to-4-Unit Major Replacements for Farm Owner-Occupied Housing
54	Farm Owner-Occupied Mobile Homes
55	1-to-4-Unit New Farm Tenant-Occupied Housing
56	Farm Tenant-Occupied Mobile Homes
57	1-to-4-Unit New Nonfarm Owner-Occupied Housing
58	1-to-4-Unit Additions and Alterations to Nonfarm Owner-Occupied Housing
59	1-to-4-Unit Major Replacements for Nonfarm Owner-Occupied Housing
60	5-or-More Unit New Nonfarm Owner-Occupied Housing
61	5-or-More Unit Additions and Alterations to Nonfarm Owner-Occupied Housing
62	5-or-More-Unit Major Replacements for Nonfarm Owner-Occupied Housing
63	Nonfarm Owner-Occupied Mobile Homes
64	1-to-4-Unit New Nonfarm Tenant-Occupied Housing
65	1-to-4-Unit Additions and Alterations to Nonfarm Tenant-Occupied Housing
66	1-to-4-Unit Major Replacements for Nonfarm Tenant-Occupied Housing
67	5-or-More Unit New Nonfarm Tenant-Occupied Housing
68	5-or-More Unit Additions and Alterations to Nonfarm Tenant-Occupied Housing
69	5-or-More-Unit Major Replacements for Nonfarm Tenant-Occupied Housing
70	Nonfarm Tenant-Occupied Mobile Homes
71	Residential Equipment
72	Other Residential Structures

Table B-2

Industrial Sectors

1987 SIC Codes Are Shown In Column 3

Industrial Sectors		
1	Farms	01,02
2	Agricultural Services, Forestry, and Fisheries	07,08,09
3	Metal Mining	10
4	Coal Mining	11,12
5	Oil and Gas Extraction	13
6	Nonmetallic Minerals, Except Fuels	14
7	Construction	15,16,17
8	Lumber and Wood Products	24
9	Furniture and Fixtures	25
10	Stone, Clay, and Glass Products	32
11	Primary Metal Industries	33
12	Fabricated Metal Products	34
13	Industrial Machinery and Equipment	35
14	Electronic and Other Electric Equipment	36
15	Motor Vehicles and Equipment	371

Table B-2 (continued)

Industrial Sectors (continued)

1987 SIC Codes Are Shown In Column 3

Industrial Sectors		
16	Transportation Equipment	37, (Except Motor Vehicles 371)
17	Instruments and Related Products	38
18	Miscellaneous Manufacturing Industries	39
19	Food and Kindred Products	20
20	Tobacco Manufactures	21
21	Textile Mill Products	22
22	Apparel and Other Textile Products	23
23	Paper and Allied Products	26
24	Printing and Publishing	27
25	Chemicals and Allied Products	28
26	Petroleum and Coal Products	29
27	Rubber and Miscellaneous Plastics Products	30
28	Leather and Leather Products	31
29	Railroad Transportation	40
30	Local and Interurban Passenger Transit	41
31	Trucking and Warehousing	42
32	Water Transportation	44
33	Transportation By Air	45
34	Pipelines, Except Natural Gas	46
35	Transportation Services	47
36	Telephone and Telegraph	481, 482, 489
37	Radio and Television	483, 484
38	Electric Services	491, Part Of 493
39	Gas Services	492, Part Of 493
40	Sanitary Services	494, 495, 496, 497
41	Wholesale Trade	50, 51
42	Retail Trade	52 Through 59
43	Federal Reserve Banks	6011
44	Commercial and Mutual Depository Institutions	60 (Except 6011)
45	Nondepository Institutions	61
46	Security and Commodity Brokers	62
47	Insurance Carriers	63
48	Insurance Agents, Brokers, and Service	64
49	Real Estate	65, 66
50	Holding and Other Investment Offices	67
51	Hotels and Other Lodging Places	70
52	Personal Services	72
53	Business Services	73
54	Auto Repair, Services, and Parking	75
55	Miscellaneous Repair Services	76
56	Motion Pictures	78
57	Amusement and Recreation Services	79
58	Health Services	80
59	Legal Services	81
61	Social Services; Museums, etc.; Membership Organizations; Engineering and Management Services; and Services, N.E.C	83, 84, 86, 87, 89

Asset Classes and Rates of Economic Depreciation: Producers durable equipment		
1	Furniture and fixtures	11.00%
2	Fabricated metal products	9.17%
3	Engines and turbines	7.86%
4	Tractors	16.33%
5	Agricultural machinery (except tractors)	9.71%
6	Construction machinery (except tractors)	17.22%
7	Mining and oil field machinery	16.50%
8	Metal working machinery	12.25%
9	Special industry machinery (not elsewhere classified)	10.31%
10	General industrial equipment	12.25%
11	Office, computing, and accounting machinery	27.29%
12	Service industry machinery	16.50%
13	Electrical transmission, distribution, and industrial apparatus	11.79%
14	Communications equipment	11.79%
15	Electrical equipment (not elsewhere classified)	11.79%
16	Trucks, buses, and truck trailers	25.37%
17	Autos	33.33%
18	Aircraft	18.33%
19	Ships and boats	7.50%
20	Railroad equipment	6.60%
21	Instruments	14.73%
22	Other producers durable equipment	14.73%
Asset Classes and Rates of Economic Depreciation: Private nonresidential structures		
1	Industrial buildings	3.61%
2	Commercial buildings	2.47%
3	Religious buildings	1.88%
4	Educational buildings	1.88%
5	Hospital and institutional buildings	2.33%
6	Other buildings	4.54%
7	Public utility structures	3.16%
8	Farm structures	2.37%
9	Mining exploration, shafts, and wells	5.63%
10	Other nonresidential structures	2.90%

Table B-3

Asset Classes and Rates of Economic Depreciation

(annual percentage rates of decline)

Producer's durable equipment

Private nonresidential structures

Source: C.R. Hulten and F.C. Wykoff, "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, pp. 367-396.

Endnotes

1. Gary Robbins and Aldona Robbins, "Eating Out Our Substance: How Taxation Affects Saving," Lewisville, TX: TaxAction Analysis, Policy Report No. 131, August 1995, Table 4, p.8.
2. The technical term for this extra output is the marginal value product of capital. Specifically, it is the added output from an extra unit of capital, holding all other inputs constant, times the price of the output.
3. This is due to the economic law of diminishing marginal productivity.
4. Known as the Fisher effect, the pretax rate must increase faster than the simple sum of the inflation and tax rates.
5. It is convenient to think of this process as the investor allocating his portfolio on the basis of the real aftertax return to capital, net of risk.
6. We do not attempt to calculate rates of return for individual assets. Rather, we compute an economy-wide rate of return which includes an average risk premium.
7. This representation is very simplified. Appendix A contains the mathematical formulae.
8. In 1994, the stock of U.S. capital, net of depreciation, was $15,690 billion, adjusted for inflation. Investors realized $663.5 billion after taxes and inflation. See Robbins and Robbins, "Eating Out Our Substance: How Taxation Affects Saving," Table 4, p.8.
9. Replacement investment comes from Table 4.2 and the stock of capital from Table 4.3 in Robbins and Robbins, "Eating Out Our Substance: How Taxation Affects Saving."
10. See Appendix B for detail.
11. Suppose there are two assets, one is replaced every two years and the other every ten. Replacement investment for the two-year asset would be five times larger than for the ten-year asset. Average depreciation based on investment, therefore, would be higher than marginal depreciation based on the stocks.
12. Income taxes are calculated in two steps. First, deductions, exclusions and exemptions are subtracted from gross income to arrive at taxable income. Second, the appropriate tax rates are applied to taxable income and credits are subtracted.
13. For example, tax law considers a computer a five-year asset. It allows 20 percent of the cost to be written off in the first year, 32 percent in the second, 19.2 percent in the third, 11.52 percent in the fourth and fifth, and 5.76 percent in the sixth. In practice, computers are often replaced in one or two years as superior models become available.
14. Because write-offs are not adjusted for inflation or the time value of money, the value of the deduction for tax depreciation declines over time.
15. This assumes that the quality of all factors of a specific type are the same. Our method of constructing the stock of capital makes adjustments over time such that $1 of an investment from previous years is the same as $1 of an investment made in the current year.
16. Several thousand assets underlie the twelve representative assets. See Appendix B for the calculation method.
17. In a normal distribution, 67 percent of the values are within plus or minus one standard deviation and 95 percent are within two standard deviations of the mean.
18. More detail on tax policy of the last four decades may be found in Gary Robbins and Aldona Robbins, "Looking Back to Move Forward: What Tax Policy Costs Americans and the Economy," Lewisville, TX: Tax Action Analysis, Policy Report No. 127, September 1994.
19. The new schedule reduced the number of categories to 100 and cut the average depreciable life of manufacturing assets from 19 years to 12 years.
20. The Revenue and Expenditure Control Act of 1968 placed a 10-percent surcharge on individual and corporate income taxes that was to last two years. Although increasing the personal exemption and standard deduction, the 1969 Act raised marginal tax rates and extended the surcharge at a 5% rate for six months. It also repealed the 7% investment tax credit, restricted depreciation write-offs, increased capital gains tax rates and reduced depletion allowances for oil, gas and minerals.
21. The Revenue Act of 1971 accelerated depreciation write-offs through the "asset depreciation range" (ADR) schedule and reinstated the 7% investment tax credit.
22. The Tax Revision Bill of 1976, however, did raise taxes on capital by limiting deductions from various investments and increasing the minimum tax for individuals and corporations.
23. The Economic Recovery Tax Act of 1981 also introduced indexation to prevent taxpayers from being pushed into higher and higher brackets. The Tax Equity and Fiscal Responsibility Act of 1982 repealed most of the depreciation relief that had been scheduled for 1985 and after and imposed new excise taxes.
24. The Tax Reform Act of 1986 lowered tax rates while broadening the tax base. Although the top rate for corporations was lowered from 48% to 34%, the remaining depreciation changes from 1981 were rolled back and other corporate deductions were eliminated. The Omnibus Budget Reconciliation Act of 1990 added a third income tax bracket at 31% and imposed a 10% luxury tax on expensive cars, boats, furs and jewelry. OBRA 1993 added two more brackets, 36 and 39.6 percent, to the individual income tax and raised the corporate tax rate from 34 to 35 percent.
25. For a discussion, see Gary Robbins and Aldona Robbins, "Cooking the Books: Exposing the Tax and Spend Bias of Government Forecasts," Lewisville, TX: TaxAction Analysis, Policy Report No. 129, February 1995.
26. This appendix is adapted from Gary A. Robbins, Aldona Robbins and Paul Craig Roberts, "The Relative Impact of Taxation and Interest Rates on the Cost of Capital," in *Technology and Economic Policy*, Dale W. Jorgenson and Ralph Landau, editors, Ballinger: Cambridge, MA, 1986, pp. 281-316.
27. A change in the price of debt will alter the equilibrium debt/equity position of the firm, changing its degree of risk, and changes in the debt/equity position alter the price of debt. This will be reflected in the real rate of discount which is being held constant for this analysis, a reasonable assumption in light of the economy-wide accounting system also being used.
28. An investment tax credit granted at the time the investment is put into service has an immediate direct tax effect. For example, a 10 percent credit will offset tax liability up to 10 percent of the asset's purchase price. (Excess credits are normally carried forward until exhausted.)

29. C.R. Hulten and F.C. Wycoff, "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.

30. Bulletin F (1941) in effect from 1941 through 1962 was superseded by Rev. Proc. 62- 21 in 1962. There have been 7 major documents covering revisions to the depreciation schedules since 1962. They are by year:

    - Rev. Proc. 72-10 and Rev. Proc. 72-25, from 1972;
    - Rev. Proc. 77-10, from 1977;
    - Rev. Proc. 82-67, from 1982;
    - Rev. Proc. 83-35, from 1983;
    - Rev. Proc. 87-56 and Rev. Proc. 87-57, from 1987.

    There were a number of minor industry updates during the 1970s and 1980s. By year they are:

    - Rev. Proc. 73-2, Rev. Proc. 73-3, Rev. Proc. 73-23, Rev. Proc. 73-24, Rev. Proc. 73-25, Rev. Proc. 73-26,
    - Rev. Proc. 73-27, Rev. Proc. 73-28, and Rev. Proc. 73-30, from 1973;
    - Rev. Proc. 74-27, Rev. Proc. 74-28, Rev. Proc. 74-29, Rev. Proc. 74-30, Rev. Proc. 74-31,
    - Rev. Proc. 74-32, Rev. Proc. 74-37, and Rev. Proc. 74-50, from 1974;
    - Rev. Proc. 76-16, Rev. Proc. 76-17, Rev. Proc. 76-18, Rev. Proc. 76-27, Rev. Proc. 76-37, from 1976;
    - Rev. Proc. 77-2, Rev. Proc. 77-3, Rev. Proc. 77-8, from 1977;
    - Rev. Proc. 78-4, and Rev. Proc. 78-5, from 1978;
    - Rev. Proc. 79-26, Rev. Proc. 79-35, Rev. Proc. 79-41, Rev. Proc. 79-42, Rev. Proc. 79-60,
    - Rev. Proc. 79-64, Rev. Proc. 79-65, from 1979;
    - Rev. Proc. 80-15, Rev. Proc. 80-33, Rev. Proc. 80-58, from 1980;
    - Rev. Proc. 88-22, from 1988.

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