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4 The Effects of Tax Rules on Nonresidential Fixed Investment: Some Preliminary Evidence from the 1980s

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By the end of the 1970s there was widespread agreement that the rate of capital accumulation in the United States was too low and that the tax system was an important reason for that low rate of investment. Net fixed nonresidential investment had fallen to only 2.7% of GNP in the second half of the 1970s, one-third less than it had been a decade earlier. The tax system depressed the return to saving and to investing in business plant and equipment by a combination of corporate and personal taxes that took 67% of the pretax return to capital in the nonfinancial corporate sector during the years 1975 to 1979.[1] The sharp increase in this effective tax rate during the 1960s and 1970s was due in large part to the interaction between the rising rate of inflation and the persistence of tax rules that base depreciation on the nominal value of capital assets and that tax artificial nominal inventory profits and nominal capital gains.[2]

Congress and the new Reagan administration responded to this problem by enacting the Economic Recovery Tax Act (ERTA) of 1981. For individual taxpayers, this legislation stimulated saving by reducing all statutory tax rates by 25% and extending eligibility for Individual Retirement Accounts to all employees in a way that permits the majority of individuals to be taxed on a consumption tax basis with all of their saving done out of pretax income. For corporations, ERTA replaced the previous system of depreciation allowances with a simplified "Accelerated Cost Recovery System" that substantially increased the pres-

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ent value of depreciation allowances. Most purchases of equipment could be depreciated over an accelerated 5-year schedule while structures could be depreciated over 15 years using a 175% declining balance schedule. ERTA also provided for further accelerations in depreciation schedules in 1985 and 1986. According to calculations presented in *The Budget of the United States for Fiscal Year 1986,* the original ERTA provisions would have reduced 1988 corporate tax receipts by $55 billion, or 56% of currently projected corporate tax receipts for that year.[3]

The reduction in the rate of inflation also reduced the effective rate of tax on corporate sector capital income. The rate of increase of the GNP deflator reached a peak of 9.6% in 1981 and then fell to 6% in 1982 and to less than 4% for each of the next 3 years. Under the ERTA tax rules, a decline in the inflation rate from 10% to 4% raises the present value of depreciation deductions and investment tax credits per dollar of equipment investment from 45.2 cents to 49.2 cents.[4] In addition, the combination of lower inflation and the voluntary shift from FIFO to LIFO inventory accounting reduced the inventory valuation adjustment from $43 billion a year in 1979 and 1980 to only $6 billion by 1984.

In short, the 1981 tax legislation and the reduction in inflation provided a very substantial increase in the incentive to invest in plant and equipment. But within a year there was enough concern about the prospective deficits that Congress and the Administration passed a new tax bill aimed at raising substantial revenue. The Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 introduced a half-basis adjustment for the investment tax credit and repealed the prospective further accelerations in the depreciation schedule. These changes implied a $43 billion rise in 1988 corporate tax receipts, effectively canceling 78% of the reduction granted in ERTA.[5] Two years later, the Deficit Reduction Act (DEFRA) of 1984 raised projected 1988 taxes by an additional $10 billion, leaving the net 1988 corporate tax reduction from all the 1980s tax legislation at only $4 billion.

Although the 1982 and 1984 tax bills eliminated essentially all the previously enacted reduction in corporate tax liabilities, some improvement in the incentive to invest remained for most corporations. For example, 5-year property has depreciation deductions and an investment tax credit with a combined present value of 45.2 cents per dollar of investment under TEFRA (with 4% inflation and a 7% real discount rate), down from 47.1 cents under ERTA but up from 43.5 cents under the pre–ERTA rules. The decline in inflation was also important in reducing the overall effective tax rate. With a 10% inflation, the present value of the depreciation and investment tax credits was 39.0% under pre–ERTA rules and 41.8 cents under TEFRA rules. Thus the shift from an environment with 10% inflation and pre-ERTA rules to 4% inflation and TEFRA rules raised the present value of depreciation and the investment tax credit from 39.0 cents to 45.2 cents, with 1.7 cents of the increase due to the change in tax rules and the remaining 4.5 cents due to the fall in inflation. Finally, the reductions in personal tax rates and in the artificial inflation tax on capital gains reduced the personal part of the overall tax wedge between the pretax return to corporate capital and the net return received by the providers of debt and equity capital.

Any analysis of the effects of these tax changes on investment must recognize that other potentially important determinants of investment were also changing during the same period. The economy slipped into 2 back-to-back recessions beginning in the second quarter of 1980 from which it did not begin to emerge until the final quarter of 1982. The tight monetary policy in 1981 and the sharp increase in projected structural deficits in the federal budget caused an unprecedented rise in real interest rates that began in 1981. Investment in particular industries and assets was substantially affected by the dramatic surge in the U.S. merchandise trade deficit which sharply reduced output in particular industries even while the overall economy was expanding. A surge of technical change in computers and related office equipment boosted the demand for those products even among firms that were not doing any investment to expand capacity.

All of these changes mean that the research presented here must be regarded as preliminary. Additional years of data will help to reduce the remaining uncertainty, especially if the fall in real interest rates and in the cost of equity capital continues. Disaggregated data can also help to resolve questions about the special factors that raise or reduce investments in particular industries and types of assets.

The simplest and most direct interpretation of the evidence developed in the present paper is that net fixed nonresidential investment increased substantially in the first half of the 1980s as a result of the improved tax climate for investment that resulted from the 1981 tax legislation and from the reduced rate of inflation. The ratio of net fixed nonresidential investment to GNP rose from 0.027 in the second half of the 1970s and 0.030 in 1980 to 0.037 in 1984 and 0.040 in the first 3 quarters of 1985. The investment–GNP ratio for these 2 years was exceeded in only 5 years in the preceding 3 decades (1965–69).

The rise in investment is consistent with the implications of 2 previously formulated simple models of investment behavior that were developed and estimated in Feldstein (1982). The first model relates the ratio of net investment to GNP to lagged values of the capacity utilization rate and of the real net-of-tax return to the providers of debt and equity capital. In the second model, the real net return is replaced by the rate of return over cost (i.e., the difference between the maximum return that firms can afford to pay to providers of debt and equity capital and the actual cost of funds). The latter model also implies that the increase in investment in recent years would have been significantly greater if the rise in the level of the real interest rates had not substantially increased the cost of funds to corporate borrowers.

The estimation of two very different models of investment behavior deserves an extra word of comment. As Feldstein (1982) pointed out, all models are "false" in the sense that they involve substantial simplifications that could in principle cause significant biases in the estimated coefficients. The only way to draw reliable inferences is to make alternative estimates that are likely to be subject to different biases. These different estimates may involve different types of data (the biases in time series analysis are different from the biases in cross-section analysis) or different model specifications. If the different analyses have similar implications, the conclusions can be held with greater confidence and we are spared the difficult problem of choosing among false models. Fortunately, that is the case in the current study.

The econometric evidence presented in sections 4.3 and 4.4 of this paper incorporates data for 1979 through 1984 as well as revised data for earlier years to reestimate the two models of investment behavior that were previously estimated with data through 1978 (Feldstein 1982). The new estimates confirm the previous findings, showing that the parameter estimates are quite stable and robust to data revisions and to changes in the sample period.

The present paper also estimates several modifications of these 2 basic investment models. The first alternative replaces the return net of all taxes with the return net of only those taxes collected at the corporate level. This return net of corporate taxes measures the return available to pension funds and other tax-exempt shareholders. It is also plausibly a better determinant of investment behavior because changes in taxes at the level of the portfolio investor affect the net return to alternative investments in a comparable way. The statistical evidence shows that this model explains past variations in investment about as well as or perhaps slightly better than the original net-of-all-taxes rate of return.

Section 4.1 of this paper presents a brief discussion of the behavior of investment during the past 3 decades with particular attention to the period since 1979. Section 4.2 then provides summary data on the basic determinants of investment, including variations in capacity utilization and in the various rate of return and cost of funds variables. It also presents an overview of the results and implications of the econometric estimates of the basic investment models. The third section then discusses the net return model in more detail and presents the estimated regression equations. Section 4.4 presents parallel evidence for the return over cost model. There is a brief concluding section that points to several directions for additional research.

4.1 Variations in Net Nonresidential Fixed Investment

The analysis of this paper focuses on the ratio of net nonresidential fixed investment to GNP. Table 4.1 presents averages of this ratio for 5-year periods between 1955–59 and 1980–84 and annual data for the years 1979 through 1985.[6]

The distinction between net and gross investment is an important one. A comparison of columns 1 and 2 of table 4.1 shows that the ratio of gross investment to net investment has been rising since the mid-1960s. Feldstein (1983) showed that capital consumption absorbed a growing share of gross investment over this period for 3 reasons: the ratio of the capital stock to GNP increased; the share of equipment in the capital stock rose (which raises capital consumption because equipment depreciates more rapidly than structures); and the nature of the equipment shifted to more rapidly depreciating types of assets. These forces were powerful enough to maintain gross investment at a constant share of GNP from the mid-1960s through the late 1970s even though the net investment ratio declined by nearly one-third.

Net investment is the economically important concept because it is net investment that determines the growth of the nation's capital stock. From a behavioral point of view, however, specifying investment behavior in terms of net investment is clearly a simplification since it

Table 4.1 Ratios of Investment to GNP

Years	Net Investment (1)	Gross Investment (2)
1955–59	0.026	0.093
1960–64	0.025	0.091
1965–69	0.042	0.106
1970–74	0.034	0.105
1975–79	0.027	0.104
1980–84	0.029	0.115
1979	0.037	0.115
1980	0.030	0.112
1981	0.032	0.116
1982	0.023	0.113
1983	0.022	0.111
1984	0.037	0.125
1985*	0.040	0.130

*Data for 1985 refer to the first 3 quarters only at a seasonally adjusted annual rate.

assumes that firms invest only in order to achieve a desired capital stock and ignores the special character of investments made for modernization and cost reduction.[7]

The data in table 4.1 show that net nonresidential fixed investment has averaged only 3.0% of GNP during the 3 decades from 1960 through 1984. The period began with investment at an even lower level, only about 2.5% of GNP, a condition that contributed to the Kennedy tax bill and the introduction of the investment tax credit. Net investment rose to over 4% of GNP in the second half of the 1960s and then declined to 3.4% of GNP in the first half of the 1970s and only 2.7% of GNP in the second half of the decade. In the 1980s, investment was initially just slightly above 3% of GNP, then declined during 1982 and 1983 to only 2.2% before rising to 3.7% of GNP in 1984 and 4.1% of GNP in 1985. At 4.0% of GNP, the 1985 level of net investment was only exceeded or equaled in 4 other years during the past 3 decades and always at a time when the level of capacity utilization was substantially higher than it was in 1985.

The models estimated and discussed in this paper relate the net investment ratio to lagged capacity utilization and to alternative measures of the profitability of investing in nonresidential fixed capital. As we noted above, there are of course a great many other specific factors that can influence the rate of investment in any period. Bosworth (1984) has emphasized that the growth of automobile leasing companies and rapid technological progress in computers caused a rapid rise in both types of investments in the 1980s and that when both of these are eliminated there is no increase in gross investment relative to GNP.[8]

Although this statistical fact is arithmetically correct, it is difficult to know what economic importance it has. Just as there were special exogenous reasons for a surge of investments in autos and computers in these years, there were also reasons for unusually low rates of investment in certain other industries. The early 1980s were characterized by an unprecedented 70% rise in the real value of the dollar and a sharp increase in real long-term interest rates to levels that had not been seen for a half-century. The result was a lopsided recovery in which industries exposed to international competition and interest-sensitive industries actually contracted while the economy as a whole was expanding. By the end of 1983, many of those industries had still not reached the level of output that they had experienced 5 years earlier. Even at the end of 1984, there were still a number of industries producing at less than their 1978 levels of output. For such industries, there was clearly far less reason to expand capacity.

More specifically, although real GNP rose 3.7% between 1979 and 1983, almost all the increase was in the production of services. The output of services rose $52.5 billion (in 1972 dollars) while the output of goods rose only $10.9 billion and the output of structures actually fell by $8.1 billion. Thus services rose 9.2% while the output of goods rose only 1.6%. Since the services sector is less capital intensive than the goods-producing sector, this very substantial shift in the composition of GNP would in itself tend to reduce the rate of investment.

Similarly, although overall industrial production rose by 3.3% during those years, production in the primary metals industries in December 1983 was 25% below the 1978 level. Production of iron and steel was 35% below the level in 1978. Production of fabricated metal products was 13% below its 1979 peak level, and auto production was down 11%. Other industries with less output in December 1983 than 5 years earlier included mining, construction, apparel, consumer home goods, and agriculture. Of these, only autos and consumer home goods had passed their 1978–79 output levels by the end of 1984.

In short, although unusual technical progress in the computer industry may have stimulated aggregate investment in the first half of the 1980s, the unusual character of the recovery caused by the unprecedented rise in the dollar and in real long-term interest rates may have depressed overall investment. The failure to extend the statistical models of investment behavior to include variables that adequately measure these influences may cause the resulting estimates of the rate of return variables to be biased. The magnitude of the potential bias depends on the relative importance for investment of the omitted factors and the extent to which they are correlated with the rate of return variables. A priori, it is not possible to determine whether the net effect of omitting both types of variables is to overstate or understate the effect of the rate of return variable. Bosworth's (1984) procedure of excluding the computer investments of the last few years without making a parallel adjustment for the adverse effects of the unbalanced recovery is clearly misleading and inappropriate. Its net effect is to understate any positive effect on investment of the recent changes in tax rules and the increase in net profitability.

4.2 An Overview of the Results

The next 2 sections of this paper and the appendixes will describe the data and econometric estimates in detail. Before turning to that analysis, we shall provide an overview of the results.

Five-year averages for the past 3 decades are presented for each of the alternative measures of net return as well as for capacity utilization and for the investment–GNP ratio. Annual data are also presented for the years 1979 through 1985. Inspection of these data shows the empirical relationships that the regression equations subsequently estimate with annual observations.

We also combine these data with the regression coefficients estimated later in the paper to answer three questions: (1) How well do the regression coefficients estimated on the basis of data for the past 3 decades explain the behavior of investment in the 1980s? (2) More specifically, how has the change in tax rules affected the rate of investment? (3) How would prospective investment be affected by the tax changes implied by the Administration's May 1985 plan and by the tax bill that passed the House of Representatives in December 1985?

The analysis begins with the net return models and then examines the return over cost models.

4.2.1 Investment and the Net Rate of Return

The basic data summarizing the relation between net investment and the net rate of return on corporate sector capital are presented in table 4.2. Column 1 repeats the investment–GNP ratios previously shown in table 4.1. The second column presents the capacity utilization rate, a fundamental determinant of fluctuations in investment.[9] Since studies generally indicate a lag that peaks at 12 to 18 months between changes in the determinants of investment and subsequent changes in investment, the capacity utilization variable and the other variables in table 4.2 are shown with a 1-year lag; thus capacity utilization for 1955–59 actually refers to the average capacity utilization rate in the period 1954–58. It is clear that periods of high capacity utilization tended to be periods of high net investment. But even with the 1-year lag there is a problem of simultaneity in interpreting this association; anything that raises the investment–GNP ratio during a period of several years will also raise the capacity utilization rate during that period. This causes the estimated investment equations to understate the importance of profitability and tax variables relative to capacity utilization.

The starting point for calculating the net-of-tax rate of return variable is the pretax return on nonfinancial corporate capital. We construct this as the ratio of profits (with economic depreciation and an inventory evaluation adjustment) before all state and local taxes plus net interest payments to the value of the corresponding corporate capital stock at replacement cost.[10]

To obtain the net rate of return (RN), we subtract from this the ratio of the taxes paid by the corporations, their shareholders, and their creditors to the capital stock. The calculation of the tax liabilities of shareholders and creditors takes into account the distribution of debt and equity income among different types of taxpayers (individuals by income class, pensions, and other tax-exempt institutions, insurance

Table 4.2 The Rate of Investment and the Net Rate of Return

				Net Rate of Return		Cyclically Adjusted Return		Cyclically Adjusted Differential Returns	
Year*	Investment–GNP Ratio (I_n/Y) (1)	Capacity Utilization (UCAP) (2)	Pretax Rate of Return (R) (3)	After All Taxes (RN) (4)	After Corporate Taxes (RNC) (5)	After All Taxes (RNA) (6)	After Corporate Taxes (RNCA) (7)	After All Taxes (RNA $-$ r_n) (8)	After Corporate Taxes (RNCA $-$ r) (9)
1955–59	0.026	0.824	0.107	0.033	0.046	0.033	0.046	—	—
1960–64	0.025	0.808	0.111	0.042	0.055	0.043	0.056	0.038	0.040
1965–69	0.042	0.880	0.137	0.060	0.077	0.056	0.071	0.041	0.042
1970–74	0.034	0.826	0.105	0.037	0.055	0.036	0.055	0.030	0.028
1975–79	0.027	0.796	0.091	0.028	0.048	0.029	0.050	0.048	0.045
1980–84	0.029	0.773	0.075	0.029	0.045	0.033	0.051	0.025	0.003
1979	0.037	0.842	0.095	0.032	0.052	0.031	0.050	0.038	0.031
1980	0.030	0.846	0.082	0.026	0.044	0.025	0.042	0.030	0.016
1981	0.032	0.793	0.070	0.019	0.037	0.021	0.040	0.021	0.001
1982	0.023	0.783	0.077	0.029	0.048	0.032	0.052	0.020	−0.011
1983	0.022	0.703	0.067	0.030	0.045	0.040	0.059	0.025	−0.002
1984	0.037	0.740	0.080	0.041	0.054	0.048	0.064	0.031	0.012
1985†	0.040	0.808	0.099	0.054	0.070	0.056	0.071	0.029	0.004

*All variables in columns 2 through 9 are lagged 1 year. Thus, capacity utilization 1965–69 refers to average capacity utilization in 1964–68.
†Investment for 1985 refers to the first 3 quarters at a seasonally adjusted rate.

companies, banks, etc.); details of the calculation are presented in Appendix A.

A high value of the net return on nonfinancial corporate capital should make this type of investment more attractive relative to other uses of funds like owner-occupied housing, government debt, real estate partnerships, and overseas investment. A comparison of columns 4 and 1 shows that there has been a strong association between the variations in this net return and the concurrent variations in the investment–GNP ratio. The net return was highest in the second half of the 1960s (6.0%) when the investment–GNP ratio was highest and lowest in the second half of the 1970s (2.8%) when the investment–GNP ratio was lowest. During the first half of the 1980s, the annual values of RN rose to a quite strong 5.4%, roughly paralleling the rise in the investment–GNP ratio.[11]

The fluctuations in the net rate of return reflect not only tax rules but also movements in pretax profitability over the business cycle and more generally. Column 6 presents a cyclically adjusted net rate of return (RNA) obtained by multiplying 1 minus the effective tax rate by a cyclically adjusted pretax return calculated by regressing the pretax return on the rate of capacity utilization and then evaluating the return that would prevail at a constant capacity utilization rate. For the 5-year periods, there is little difference between the cyclically adjusted returns of column 6 and the unadjusted returns of column 4 although cyclical adjustment does lower the 1965–69 return and raise the 1980–84 return. Cyclical adjustment is more important with the annual data and shows that the cyclically adjusted net return rose steadily from 2.1% for 1981 to 5.6% for 1985. The important implication of these figures is that they indicate that the close association between the investment–GNP ratio and the real net rate of return does not merely reflect cyclical fluctuations in profitability but is based on changes in effective tax rates and persistent changes in pretax profitability.

Column 5 presents an alternative measure of net profitability that subtracts only those taxes paid by corporations to the federal government and to state and local governments. We label the resulting variable RNC to denote that it is the return net of corporate taxes. Taxes paid by individuals and other portfolio investors are ignored. There are 2 possible reasons for preferring this RNC variable to the return net of all taxes (RN). First, for a very important class of investors, including pension funds and foreign investors, only the corporate tax is relevant. The return after corporate taxes governs the net return that they can earn as portfolio investors and therefore their willingness to direct their assets into nonfinancial corporate capital. Second, for taxable individual investors, the changes in personal tax rates that affect the ultimate net return on corporate capital (RN) also affect the net return on competing investments. The link is not complete because the RN variable reflects the specific ownership of debt and equity securities, the taxation of real and nominal capital gains, and other features that are specific to the return on nonfinancial corporate capital. But fluctuations in RN induced by the changes in taxes paid by shareholders and creditors probably exaggerate the changes in the relative desirability of investing in nonfinancial corporate capital.

The variations in the real return net of corporate taxes (RNC) generally parallel the shifts in the real return net of all taxes (RN) with the highest value in the second half of the 1960s (RNC = 0.077) and the lowest values in the first half of the 1980s (RNC = 0.045). The difference between the 2 measures does vary from time to time, depending on the tax rules for individuals and the rate of inflation. From 1955 through 1969, personal taxes and other taxes paid by portfolio investors (including banks and insurance companies) took approximately 24% of the return after corporate taxes (i.e., the final net return RN was 76% of the return net of corporate taxes RNC), but this rose to 33% in the first half of the 1970s and 42% in the second half of the 1970s as inflation created high levels of artificial nominal interest income and nominal capital gains that were taxed to portfolio investors. By 1984, the combination of personal tax changes and reduced inflation lowered the effective tax on portfolio investors to about 23% of the return after corporate taxes.

A cyclically adjusted net return after corporate taxes (RNCA) is shown in column 7. The 5-year averages of this measure show greater stability than the other measures of net return in columns 4 through 6. Nevertheless, the period 1965–69 continues to stand out as a time when the net return was high and the period from 1975 through the early 1980s remains a period of low net profitability. This measure also shows a sharp rise in net real return from 4.0% for 1981 to 7.1% for 1985 (i.e., 4.0% in 1980 and 7.1% in 1984). Although this increase is not as great as the rise in the full net return (RNA), there was clearly a very substantial rise in net profitability in these years that did not reflect either cyclical fluctuations in pretax profitability or changes in personal tax rates.

Estimated Effects of Changes in the Net Return

Section 4.3 presents estimated equations relating the investment–GNP ratio to the capacity utilization rate and to each of these 4 measures of the net return. That analysis confirms that there is a strong and statistically significant relationship between investment and the net return in the previous year. The current estimates for the sample period 1954–84 (and for subperiods within these 3 decades) are very similar to the results obtained in Feldstein (1982) with data for 1954 through

1978. The similarity of the coefficient estimates persists even though there was a major revision of the national income accounts in 1980 that changed much of the earlier data and despite a number of small improvements in the method that we have used to calculate the net rate of return variables. The earlier analysis did not consider the return net of corporate tax variables (RNC and RNCA), but these are now found to explain variations in the investment ratio as well as or better than the full net return variables (RN and RNA).

A typical example of the estimated equations implies that each percentage point increase in the real net rate of return increases the investment–GNP ratio by about 0.4 percentage points. The actual equation relates the investment–GNP ratio to the net rate of return (RN) in the immediate past year and to the capacity utilization rate (UCAP) in that same past year. When this equation is estimated with data for 1954 through 1984, the coefficient of the net return variable is 0.41 (with a standard error of 0.12). That same equation implies that each percentage point increase in capacity utilization raises the investment–GNP ratio by about 0.02 percentage points.

Although these coefficients can only approximate an average relationship over the 30-year sample period, it is interesting to see how well they explain major shifts in the investment ratio between particular dates. Consider first the sharp fall in investment between the high of 4.2% of GNP in the 1965–69 period and the 2.7% of GNP a decade later, a decline of 1.5% of GNP. Between these same periods the net return fell from 6.0% to 2.8%. This 3.2 percentage point decline and the estimated coefficient of 0.4 imply a fall of 1.3 percentage points in the investment–GNP ratio. The concurrent 8 percentage point decline in capacity utilization (from 88.0% in 1965–69 to 79.6% in 1975–79) and the estimated coefficient of 0.02 imply a fall of 0.2 percentage points in the investment–GNP ratio. Thus the decline in the net return and in capacity utilization together imply a fall of 1.5 percentage points in the investment–GNP ratio, exactly what was observed. More than 85% of this fall was attributable to the decline in the net return.

Of course, not all movements in investment can be explained as satisfactorily by the simple models used here. For example, investment rose between the early 1960s and the early 1970s even though the equation would have predicted a decline of 0.2% in the investment–GNP ratio. What matters for the purpose of this study is not the ability to provide a perfect explanation of year-to-year variations of investments (although $\bar{R}^2 = 0.60$ indicates a quite good explanation of the volatile investment–GNP ratio without the use of long distributed lags or lagged dependent variables) but the ability to measure the impact of tax changes on the level of investment.

The predictions of the simple net return model also fit well with the experience of the 1980s. The investment–GNP ratio rose from 3.3% in the years 1979–81 to 3.9% in 1984–85. The corresponding (lagged) measures of the real net return rose from 2.6% to 4.8%, implying a 0.9 percentage point rise in the investment–GNP ratio while the 5 percentage point decline in capacity utilization implies a 0.1 percentage point fall in the investment–GNP ratio. Thus the equation predicts a 0.8 percentage point increase in the investment–GNP ratio while the actual investment ratio increased 0.6 percentage points. In short, investment increased slightly less than predicted on the basis of the stronger investment incentive as measured in this way.[12]

It is interesting to decompose the effect of the change in the net return during these years into the effect of the change in tax rules and the effect of the change in the pretax rate of return. The effective tax rate declined from 69.0% in the years 1978–80 (i.e., the years relevant for investment in 1979–81) to 47.0% in years 1983–84. The pretax rate of return rose from 8.2% for the early years to 9.0% for the later years. If the tax rate had remained at the 1978–80 value while the pretax return rose, the net of tax return (RN) would have increased by 0.25 percentage points. The implied increase in the investment–GNP ratio would then be 0.1 percentage points. In contrast, if the pretax return had remained at 8.2% while the effective tax rate fell from 69.0% to 47.0%, the after-tax return would have increased by 1.8 percentage points. The implied increase in the investment would be 0.7 percentage points. Thus the fall in the effective tax rate was about 7 times as important in stimulating a rise in investment as the increase in the pretax rate of return. The capacity utilization rate actually fell slightly during this period, decreasing by just about enough (5.3 percentage points) to offset the rise in the pretax rate of return.[13] The decline in the effective tax rate is thus responsible for all the predicted rise in investment.

Of the initial 69.0% effective tax rate, 30.6 percentage points represented the federal corporate tax rate, 15.8 percentage points were state and local profits and property taxes paid by corporations, and 22.6 percentage points were federal and state income taxes paid by individuals and other providers of debt and equity capital. By 1983–84, these percentages had declined to 17.0%, 14.0%, and 16.0%. These figures imply that the taxes paid by the corporations to the federal, state, and local governments fell from 46.4% of the real pretax return to 31.0% of that return, a decline of one-third in the effective tax rate at the corporate level. The taxes paid by portfolio investors were initially 22.6% of the pretax return, or 42.2% of the return that remained after the taxes paid by corporations. By 1983–84, this declined to 16.0%

of the pretax return, or 23.2% of the return that remained after the taxes paid by corporations, a decline of nearly one-half.

To calculate what these effective tax rate declines contributed to the predicted rise in the investment–GNP ratio, we assume that the initial 8.2% pretax return remains fixed for all years. As we already noted, the decline in the overall effective tax rate implied a 1.8 percentage point rise in the real after-tax return and therefore a 0.7 percentage point increase in the investment–GNP ratio. Slightly less than two-thirds of this was accounted for by the decline in the effective federal corporate tax rate: the 13.6 percentage point decline in that effective tax rate represented a 1.1 percentage point rise in the real after-tax return and therefore an investment–GNP rise of 0.45 percentage points.

The model also provides a basis for making a very rough calculation of how investment would respond to future changes in tax rules like those proposed by the Administration in May 1985 or the ones enacted by the House in December 1985. The Administration's proposal would raise corporate tax liabilities by approximately 25% while cutting personal taxes by about 7%. It is difficult to translate the personal tax changes into a change in the effective tax rate on the interest, dividends, and capital gains arising from the earnings of nonfinancial corporations. Much of the interest and dividend income is received by pension funds and other portfolio investors that are not currently taxed and that would not be affected by the change in personal tax rates. Although the maximum marginal tax rate on interest and dividends received by individuals would be reduced from 50% to 35%, much of the overall reduction in personal taxes would take the form of an increase in the personal exemption that left the tax rate on capital income unchanged. In addition, special provisions would limit the use of 401k saving plans and would impose heavier taxes on financial institutions. Fortunately, the calculation is not very sensitive to alternative assumptions about the change in the effective tax on individuals and other portfolio investors.

For the purpose of this calculation, we assume that the pretax rate of return and the rate of capacity utilization would remain unchanged. Federal corporate taxes in 1984 took 16.6% of the total real pretax return on nonfinancial corporate capital. A 25% increase in federal corporate liabilities would raise this to 20.8%. The combined federal, state, and local taxes paid by corporations would rise from 29.6% to 33.8% of pretax capital income. The return net of corporate taxes would therefore fall from 70.4% of pretax income to 66.2%. Taxes on individuals and other portfolio investors in 1984 took 21.7% of the net capital income after corporate taxes. If this fraction remained unchanged, the effect of the modified corporate tax rates would be to reduce the final net share of pretax capital income received by portfolio investors from 55.1% (i.e., 78.3% of 70.4%) to 51.8% (i.e., 78.3% of 66.2%).

If the pretax rate of return is unchanged, the after-tax rate of return (RN) would fall from the 5.5% observed in 1984 to 5.1%. Since each percentage point decline in the real net return causes a 0.4 percentage point decline in the investment–GNP ratio, this projected decline in the net return (from 5.4% to 5.1%) would reduce the investment–GNP ratio by about 0.12 percentage points. This represents about 3% of the investment level in 1984–85 and about one-fifth of the increase in investment between 1979–81 and 1984–85.

A 5% increase or decrease in the tax paid by individual and institutional portfolio investors would alter this change in investment by about one-fifth of its value. Thus an average decline of 5% in the effective tax on portfolio investors (from 21.7% of the after-corporate-tax return to 20.6%) would imply a decline in the investment–GNP ratio that was about 3% of the 1984–85 level, or one-sixth of the increase since 1979–81. Conversely, a rise of 5% in the effective tax rate on portfolio investors (from 21.7% of the after-corporate-tax return to 22.8%) would imply a decline in the investment–GNP ratio that was about 5% of the 1984–85 level, or one-third of the increase since 1979–81.

The bill passed by the House of Representatives in December 1985 would depress investment by substantially more than the Administration proposal. A critical difference between the two plans is that the Administration plan calls for full indexing of the base for depreciation while the House version would index the depreciation base only to the extent of half of the inflation in excess of 5%. At a 5% inflation rate, indexing raises the present value of depreciation allowances in the Administration's plan by 15% for most types of equipment (the class 4 assets under the Administration's plan). At a 10% inflation rate, fully indexed depreciation would have a present value 22% higher than the "half indexed over 5 percent" depreciation provided by the House bill.

The difference in indexing rules is even more important for structures. At a 5% inflation rate, indexing raises the present value of depreciation allowances for most structures by 60%. At a 10% inflation rate, the fully indexed depreciation would have a present value that is 84% higher than the half indexed over 5% depreciation provided by the House bill.

The House bill is also more harmful to investment in a variety of other ways. It would depreciate the typical equipment investment over 10 years instead of the 7 years provided by the Administration, although at a double-declining balance rate instead of the approximately 1.5 times declining balance rate prescribed in the Administration plan. The House also enacted a slightly higher corporate tax rate than the Administration proposed.

Because of the lack of indexing and the difference in the timing of depreciation, the House bill eventually raises corporate taxes by much more than the Administration bill. Although both bills would raise corporate taxes by about 25% in 1987 and 1988, by 1990 the Administration bill would increase the corporate tax by 23% and the House would increase it by 37%. Under the House bill, corporate taxes would rise by about 50% in the first half of the 1990s, twice the increase that we have assumed in evaluating the potential impact of the Administration plan.

To evaluate the impact on investment, we again assume that the pretax rate of return and the rate of capacity utilization are unaffected. Since federal corporate taxes in 1984 took 16.6% of the total real pretax return on nonfinancial corporate capital, the 50% increase implied by the House bill would raise that to 24.9%. The combined federal, state, and local taxes paid by corporations would rise from 29.6% to 37.9%. Taxes on individuals and other portfolio investors in 1984 took 21.7% of the net capital income after all corporate taxes. If this fraction remained unchanged, the effect of the House plan would be to reduce the final net share of real pretax capital income received by portfolio investors from 55.1% (i.e., 78.3% of 70.4%) to 48.6% (78.3% of 62.1%).

With the pretax return unchanged at 9.9%, the after-tax return (RN) would fall from the 5.4% actual value in 1984 to 4.8%. This projected decline would reduce the investment–GNP ratio by 0.24%, or twice the decline implied by the Administration bill. This represents about 6% of the investment level in 1984–85 and about 40 percent of the increase in the investment–GNP ratio between 1979–81 and 1984–85.

The Return Net of Corporate Taxes

These particular numerical conclusions depend on the specification of the net return after all taxes as the key determinant of the investment–GNP ratio. The alternative equation relating net investment to the return after corporate taxes (RNC) implies a somewhat larger effect of the Administration's proposed tax changes. Section 4.3 shows that estimates of the RNC equation imply that each percentage point change in the net return at the corporate level shifts the investment–GNP ratio by 0.45 percentage points. More important than the slight increase in this coefficient is the fact that the change in the net return at the corporate level is not diluted by subsequent portfolio taxation.

Consider the implications of this specification for the change in effective tax rates and investment between 1979–81 and 1984–85. The effective tax rate at the corporate level fell from 46.4% of the 8.2% pretax return to 31.0% of the 9.0% pretax return. The return net of the corporate tax thus rose from 4.4% to 6.2%. Multiplying the 1.8 percentage point rise by the 0.45 investment sensitivity figure implies a rise in the investment–GNP ratio of 0.8 percentage points. Since the decline in the capacity utilization rate implied a 0.1 percentage point fall in the investment–GNP ratio and the actual investment–GNP ratio rose 0.6 percentage points, the rise in the net return after the corporate tax explains the actual movement in the investment–GNP ratio quite well.

To isolate the impact of the change in tax rates, note that if the pretax return had remained constant at 8.2%, the decline in the effective tax rate at the corporate level would have raised the return net of corporate taxes by 1.2 percentage points and therefore increased the investment–GNP ratio by 0.54 percentage points, almost the entire observed rise.

The estimated sensitivity of the investment–GNP ratio to the return net of the corporate tax implies that a relatively modest increase in the effective corporate tax rate would have a substantial impact on the investment–GNP ratio. Thus a fall in the return net of corporate taxes from 70.4% of pretax income to 66.2% (as implied by the Administration's tax proposal) would reduce the 1984 value of the return net of corporate taxes from 7.0% (RNC = 0.070) to 6.5%. This 0.5% fall in the net rate of profit would translate into a 0.22 percentage point decline in the investment–GNP ratio. This is a decline of nearly 6% of the 1984–85 investment–GNP ratio and more than one-third of the rise in the investment–GNP ratio from the level of 1979–81.

The fall in the return net of corporate taxes from 70.4% to 62.1%, as implied by the House bill, would reduce the 1984 value of the return net of all corporate taxes from 7.0% to 6.1%. This 0.9% fall in the net rate of profit would translate into a 0.41 percentage point decline in the investment–GNP ratio. This is a decline of 11% of the 1984–85 investment–GNP ratio and three-quarters of the rise in the investment–GNP ratio of 1979–81.

Relative Rates of Return

Increases in the real net return on corporate capital raise the investment–GNP ratio by attracting funds away from alternative uses. This suggests that the behavior of investment might be better explained and predicted if the statistical model explicitly included the real return on alternative assets as well as the return on investments in nonfinancial corporate capital. The problem with doing this in practice is that there are a wide range of alternatives to investment in corporate capital including government debt, real estate, oil drilling and other natural resource investments, overseas investments, owner-occupied housing, consumer durables, and other forms of consumer spending.

Moreover, as the experience of the early 1980s dramatically demonstrated, a substantial amount of U.S. investment can be financed by an inflow of capital from the rest of the world. The U.S. current account deficit in 1984 was $101 billion, or 2.8% of GNP, implying that the capital inflow was equivalent to approximately two-thirds of all net fixed nonresidential investment. By contrast, the United States had a current account surplus in 1980 and invested more abroad than foreigners invested in the United States.

The present paper makes a first step in analyzing the sensitivity of investment to other rates of return by explicitly including the real net return on government bonds. For this purpose, we measure the nominal return on government bonds by the yield on 5-year Treasury bonds and calculate the real interest rate by subtracting an estimate of the expected rate of increase of the GNP deflator during the same 10 year period.[14] The difference between the real cyclically adjusted net return to corporations (RNCA) and the expected rate of inflation is presented in column 9 of table 4.2. For the real return on corporate capital net of all taxes (RNA), the analogous comparison is to the real net-of-tax interest rate, that is, the net of tax nominal interest rate minus the expected rate of inflation. For this purpose, we use the same effective tax rate on nominal interest income that is used for the interest component of the portfolio income generated by the nonfinancial corporate capital. This is a weighted average of the marginal tax rates of individuals in different tax brackets and of different types of taxable and nontaxable financial institutions.[15] The difference between the real net return on corporate capital and the real net interest rate is shown in column 8 of table 4.2.

It is clear that neither measure of the relative return on corporate capital has moved closely with the variations in the investment–GNP ratio. Both measures showed the greatest differential in favor of corporate capital in the 1975–79 period when the investment–GNP level was actually very low. This occurred because the very high level of actual and expected inflation during these years caused the real return on Treasury bonds to drop to only 1% and the real net-of-tax return on those bonds to become negative. Moreover, the investment–GNP ratio rose significantly in the 1980s even though the differential between the return to corporate capital and to government bonds declined because of the rise in the real return on government bonds.

These observations indicate that the yield differential between corporate capital and government bonds is not a good measure of the attractiveness of corporate investment. As we noted above, investors face a wide range of alternative investments. Moreover, whatever the yield on Treasury bonds, they can only displace saving to the extent that the government deficit increases the stock of bonds. And recent experience shows that a combination of high yields on government bonds and on corporate capital can at least temporarily attract substantial funds from the rest of the world. Until a far more complete model of the alternative to corporate capital investment is implemented, it seems better to focus on the real net return to corporate capital rather than on a differential rate of return.

4.2.2 Investment and the Rate of Return over Cost

The analysis relating investment to the net rate of return is the simplest possible model of investment behavior. The economy is treated like a black box in which the mechanism is obscure but which produces the plausible result that more capital flows into nonfinancial corporate capital when the rate of return on that type of asset is high.[16]

We now turn to a more explicit model of investment behavior in which corporate demand to invest reflects the difference between the profitability of new additions to the stock of plant and equipment and the cost of funds with which to finance that investment. This approach, labeled the return over cost model of investment, differs from the previous analysis in two fundamental ways. First, the investment decision is explicitly made by the corporation. Second, the decision reflects a comparison of the cost of funds and the prospective yield on new marginal investments rather than the yield on existing capital.

The return over cost model is the empirical implementation in a world of taxes and mixed debt-equity finance of the simple textbook model in which the rate of investment depends on the rate of interest and the marginal efficiency of investment. To make that operational, the location of the investment demand schedule is represented by the rate of return that the firm can afford to pay for funds used to finance a "typical" project. This return, which we label the "maximum potential net return",[17] is analogous to the internal rate of return of a project in an economy without taxes. Changes in tax rules, inflation, and pretax profitability all alter the maximum potential net return and therefore the incentive to invest.

More specifically, the maximum potential real net return (MPRNR) is the maximum real return that a corporation can pay to the providers of debt and equity capital on a project that consists of both equipment and structures in a ratio that matches the equipment-structure ratio of the nonfinancial corporate capital stock. Two sets of calculations are presented: in one the pretax real rate of return is fixed at 10.3%, the average pretax return during the period 1961 to 1984. In the other, the calculation assumes that the pretax return varies from year to year and is equal to the then current *ex post* return on nonfinancial corporate capital.

The calculations described in more detail in section 4.4 show that, for example, with a pretax return of 10.3%, the tax rules of 1984, and an expected inflation rate of 5.5%, the maximum potential real net return that the firm could pay to the providers of capital would be 7.3%. The maximum potential net return measure is "net" in the sense that it represents the net cost that the firm can afford to pay after taking the tax deduction for interest expenses. In 1984, the nominal interest rate on high grade corporate debt was 12.3%, implying that the net-of-tax cost of debt was 6.6% and the real net cost of debt was 1.1%. The required real return on equity capital (i.e., the ratio of economic earnings to the share price) was, however, 8.4%. We assume that firms are forced by risk considerations to use a mixture of two-thirds equity and one-third debt (approximately the average ratio during the sample period) to finance their investments. The weighted average real net cost of funds in 1984 was therefore 0.33 (1.1) + 0.67 (8.4) = 6.0 percent.[18]

Table 4.3 presents summary data on the maximum potential real net return (MPRNR) and the real net cost of funds (RCOF). For reference, the investment–GNP ratio is presented in column 1 and the capacity utilization rate in column 2. Column 3 shows that the changes in tax rules raised the MPRNR between the early 1960s and the second half of that decade and that the 1981–82 changes in tax rules and the sharp fall in inflation have caused a very substantial increase in the MPRNR since 1980.

Column 4 shows the effect of dropping the assumption of constant pretax profitability and assuming instead that firms adjust their projected future pretax profitability in proportion to the annual variations in observed pretax profitability. This calculation, which obviously exaggerates the extent to which firms react to year-to-year variations in profits, shows a much stronger increase in the MPRNR in the second half of the 1960s but much lower values in the 1980s.

The real net cost of funds is shown in column 5 and the difference between the maximum potential return and the cost of funds in columns 6 and 7. The real cost of funds was relatively high in the late 1960s, was high again in the late 1970s (when the high cost of equity outweighed the very low cost of debt), and rose again in the 1980s because of the combination of high real interest rates, low inflation, and relatively high equity costs.

Although the effect of the variations in the real cost of funds has been to leave the 5-year average difference between the maximum potential return and the cost of funds almost constant, the individual annual values show substantial variation. Column 6 shows that the difference (MPRNR − RCOF) rose from 0.7% for 1979 to 2.9% for 1984, implying a substantial increase in the incentive to invest.

Table 4.3 **The Rate of Investment and the Rate of Return over Cost**

Year*	Investment–GNP Ratio (I_n/Y) (1)	Capacity Utilization (UCAP) (2)	Maximum Potential Real Return: Fixed Profitability (MPRNR) (3)	Maximum Potential Real Return: Varying Profitability (MPRNRVP) (4)	Real Cost of Funds (RCOF) (5)	Maximum Potential Return Minus Cost of Funds: Fixed Profitability (MPRNR − RCOF) (6)	Maximum Potential Return Minus Cost of Funds: Varying Profitability (MPRNRVP − RCOF) (7)
1961–64	0.026	0.806	0.050	0.057	0.033	0.017	0.024
1965–69	0.042	0.880	0.059	0.074	0.041	0.018	0.033
1970–74	0.034	0.826	0.051	0.052	0.036	0.015	0.016
1975–79	0.027	0.796	0.056	0.050	0.040	0.016	0.010
1980–84	0.029	0.773	0.068	0.052	0.050	0.018	0.002
1979	0.037	0.842	0.059	0.049	0.052	0.007	−0.003
1980	0.030	0.846	0.061	0.040	0.053	0.008	−0.013
1981	0.032	0.793	0.059	0.036	0.047	0.012	−0.011
1982	0.023	0.783	0.072	0.055	0.053	0.019	0.002
1983	0.022	0.703	0.075	0.061	0.053	0.022	0.008
1984	0.037	0.740	0.075	0.068	0.046	0.029	0.022
1985†	0.040	0.808	0.073	0.072	0.060	0.013	0.012

*All variables in columns 2 through 7 are lagged 1 year. Thus, capacity utilization 1965–69 refers to average capacity utilization in 1964–68.
†Investment for 1985 refers to the first 3 quarters at a seasonally adjusted rate.

Estimated Effects of Changes in the Return over Cost

The regression equations presented in section 4.4 relate the investment–GNP ratio to the rate of return over cost (MPRNR – RCOF) in the immediate previous year and to the capacity utilization rate in that year. The estimated coefficient of the rate of return over cost variable implies that each 1 percentage point increase in that differential raises the investment–GNP ratio by 0.3 percentage points. The estimated equation also implies that each percentage point increase in capacity utilization raises the investment–GNP ratio by 0.09 percentage points.

Although these values cannot be expected to explain each short-run fluctuation in the investment–GNP ratio, it is interesting to see what their implications are for the recent shifts in tax policy and in the cost of funds and to speculate about the likely effects of future changes in tax rules. The rate of return over cost relevant for 1979–81 averaged 0.009 and rose to 0.021 for 1984–85. The rise of 0.012 implies an increase in the investment–GNP ratio of 0.36%, thereby accounting for 60% of the observed rise in the investment–GNP ratio between the 3.3% average for 1979–81 and the 3.9% average for 1984–85. However, the fall in capacity utilization between these two same dates (from 0.827 for 1979–81 to 0.774 for 1984–85) outweighed the improvement in the rate of return over cost and, according to the statistically estimated equation, implied that the investment–GNP ratio should have declined over the period. One possible reason for this forecast error is that businesses in 1979 and 1980 recognized that the high level of capacity utilization at that time was transitory because the shift toward a tight monetary policy that began in October 1979 would inevitably bring about a substantial recession.

The experience for the 1980s as a whole also shows the offsetting effects of an improved tax environment and the increasing cost of funds. The maximum potential real net return rose from 6.0% for 1979–81 (i.e., in 1978–80) to 7.3% for 1985; the increase of 1.3 percentage points implies an increase in the investment–GNP ratio of 0.4 percentage points. But during these same years, the real cost of funds rose from 5.1% to 6.0%, offsetting two-thirds of the increased incentive to invest. It is interesting to note that the cost of equity funds was the same for 1985 as it had been for 1979–81, implying that the entire increase in the cost of funds was due to the rise in the cost of debt (from a real 3.4% for 1979–81 to 6.0% for 1985). To the extent that the increase in the deficit in the federal budget was responsible for this rise in the rate of interest, it had the effect of offsetting a large part of the increased incentive to invest that resulted from the change in tax rules and the reduction in inflation.[19]

The relation between the investment–GNP ratio and the rate of return over cost gives some hint of how future fiscal policies might affect the future investment level. According to the estimates in Feldstein (1986), a decline of the projected budget deficit from the 4% of GNP prevailing in 1984 to 1% of GNP would reduce the real interest rate by approximately 3 percentage points (and therefore back to its historic norm). This in turn would lower the cost of capital by 1 percentage point if it left the cost of equity capital unchanged and by 3 percentage points if the returns on debt and equity declined by equal amounts. The estimated relation between the investment–GNP ratio and the rate of return over cost implies that this fall in the cost of capital would raise the investment–GNP ratio by between 0.3 percentage points and 0.9 percentage points, an increase equal to between 10% and 30% of the average investment–GNP ratio of the past quarter-century.

The changes in the tax law that the Administration proposed in May 1985 would reduce the MPRNR by only about 0.2 percentage points at the 1984 rate of inflation, from 7.3% to 7.1%. This decline reflects a sharper decline for equipment and an actual increase for structures. This decline in the rate of return over cost (assuming that the real cost of funds remained unchanged) would reduce the investment–GNP ratio by only about 0.06 percentage points, or about 2% of the investment–GNP level in 1984–85. The MPNR–COF framework thus implies only about half of the reduction in the overall investment–GNP ratio in response to the Administration's bill as the reduction implied by the RN and RNC calculations. In considering this relatively small total reduction, it should be recalled that the fall in the MPRNR for equipment is much more substantial so that the composition of the overall investment would change in the direction of structures and away from equipment. The magnitude of this shift will be examined in a later paper using the MPRNR data disaggregated into structures and equipment.

In contrast to the small effect of the president's plan on aggregate investment, the House bill implies that the MPRNR for 1984 would fall from 7.3% to 5.9%. If the cost of funds remained unchanged, the resulting 1.4 percentage point decline in the rate of return over cost would reduce the investment–GNP ratio by approximately 0.42 percentage points. This decline is 7 times larger than the decline implied by the Administration's plan. The fall in the investment–GNP ratio would be approximately 11% of the 1984–85 level of that ratio and three-quarters of the rise in the investment–GNP ratio from 1979–81 to 1984–85. This agrees almost exactly with the decline in the investment–GNP ratio implied by the model that relates that investment ratio to the rate of return net of taxes at the corporate level.

4.3 The Net Return and the Rate of Investment: Statistical Evidence

This section presents the estimated equations relating the investment–GNP ratio to the net rate of return on the capital of nonfinancial corporations. Appendix A describes the calculation of the pretax rate of return on that capital and of the tax rates paid by corporations and portfolio investors that provide debt and equity capital. Appendix A also presents the annual time series of the basic regression variables (that were summarized in table 4.2) and of the components of the tax rate.

Equation (1) reproduces the basic specification estimated in Feldstein (1982) relating the ratio of net investment to GNP (I_t^n/Y_t) to the real net rate of return in the previous year (RN_{t-1}) and the rate of capacity utilization ($UCAP_{t-1}$). The equation is estimated with a first-order autocorrelation correction, and the simultaneously estimated autocorrelation coefficient is presented as the coefficient of the variable u_{t-1}.

$$(1) \quad I_t^n/Y_t = \underset{}{-0.014} + \underset{(0.095)}{0.459\, RN_{t-1}} + \underset{(0.025)}{0.028\, UCAP_{t-1}} + \underset{(0.25)}{0.29\, u_{t-1}}$$

$$\bar{R}^2 = 0.754, \ DWS = 2.04, \ 1954–78$$

After this equation was estimated in the summer of 1980, the Commerce Department prepared a major data revision that substantially modified a number of the series used to calculate each of the variables. In addition, in preparing to reestimate this and other equations, we have introduced a number of improvements in the procedure used to calculate the real net return to capital. Nevertheless, when this equation is reestimated with the new data for the same period, the resulting parameter estimates are very similar to those presented in Feldstein (1982):

$$(2) I_t^n/Y_t = -0.004 + \underset{(0.114)}{0.453\, RN_{t-1}} + \underset{(0.025)}{0.020\, UCAP_{t-1}} + \underset{(0.230)}{0.445\, u_{t-1}}$$

$$\bar{R}^2 = 0.698, \ DWS = 1.99, \ 1954–78$$

Extending the sample through 1984 has very little effect on the estimated coefficients:

$$(3) I_t^n/Y_t = -0.003 + \underset{(0.116)}{0.412\, RN_{t-1}} + \underset{(0.024)}{0.021\, UCAP_{t-1}} + \underset{(0.206)}{0.431\, u_{t-1}}$$

$$\bar{R} = 0.598, \ DWS = 1.92, \ 1954–84$$

The coefficient of the net return variable is 0.412, implying that each 1 percentage point rise in RN causes the investment–GNP ratio to rise by 0.412 percentage points. The associated elasticity at the mean values of RN (0.038) and of the investment–GNP ratio (0.030) is 0.52.

The persistently strong effect of the real net return does not reflect the dominant effect of the early years or of any other part of the sample. When the sample is divided in half, the effect of the real net return is quite strong in both halves. For the period from 1954 through 1969 we obtain

$$\text{(4a)}\; I_t^n/Y_t = \underset{}{-0.055} + \underset{(0.067)}{0.433}\,\text{RN}_{t-1} + \underset{(0.023)}{0.079}\,\text{UCAP}_{t-1} - \underset{(0.253)}{0.565}\,u_{t-1}$$

$$\bar{R}^2 = 0.808,\ \text{DWS} = 2.17,\ 1954\text{–}69$$

The results for the second half of the sample are

$$\text{(4b)}\; I_t^n/Y_t = -0.040 + \underset{(0.136)}{0.576}\,\text{RN}_{t-1} + \underset{(0.022)}{0.065}\,\text{UCAP}_{t-1} + \underset{(0.347)}{0.166}\,u_{t-1}$$

$$\bar{R}^2 = 0.611,\ \text{DWS} = 1.79,\ 1970\text{–}84$$

The coefficient of RN is actually higher in each of the sample periods than it is for the overall period. In particular, the evidence for the most recent 15 years implies an effect that is nearly 40% stronger than for the entire sample.

The estimated coefficients are also quite insensitive to the use of the autocorrelation correction. When the equation is reestimated for the entire period by ordinary least squares, the coefficient of RN shifts only from the 0.41 value presented in equation (3) to 0.37. Even more reassuring are the estimates obtained when the basic specification is first-differenced:

$$\text{(5)}\quad \frac{I_t^n}{Y_t} - \frac{I_{t-1}^n}{Y_{t-1}} = 0.0004 + \underset{(0.126)}{0.422}\,(R_{t-1} - R_{t-2})$$

$$+ \underset{(0.022)}{0.022}\,(\text{UCAP}_{t-1} - \text{UCAP}_{t-2})$$

$$\bar{R}^2 = 0.317,\ \text{DWS} = 2.45,\ 1955\text{–}84$$

The stability of these parameter estimates is certainly very impressive, indicating that the investment–GNP ratio does respond to year-to-year variations in RN and UCAP and not just to the broad shifts in these variables.

We have also tested the simple lag structure of the basic specification and found that the implications about the effects of RN and UCAP are unchanged when more general lag structures are estimated. Equation

(6) shows that a second lagged value of RN is not statistically significant and that the sum of the 2 coefficients is increased only modestly above the coefficient of a single RN variable:

$$(6)\quad I_t^n/Y_t = \underset{}{-0.0002} + \underset{(0.126)}{0.351\ \mathrm{RN}_{t-1}} + \underset{(0.143)}{0.156\ \mathrm{RN}_{t-2}} + \underset{(0.033)}{0.014\ \mathrm{UCAP}_{t-1}} + \underset{(0.233)}{0.488\ u_{t-1}}$$

$$\bar{R}^2 = 0.616,\ \mathrm{DWS} = 1.84,\ 1955\text{–}84$$

This conclusion is confirmed when the lagged values of RN are replaced by a second-order polynomial distributed lag over 4 lagged values with no restriction on the final distributed lag coefficient. The sum of the lag coefficients is 0.419 with a standard error of 0.229. The lagged UCAP variable has a coefficient of 0.022 with a standard error of 0.037, and the $\bar{R}^2$ value is 0.624.

Additional lagged values of the capacity utilization variable are also insignificant and leave the coefficient of the RN variable essentially unchanged:

$$(7)\quad I_t^n/Y_t = -0.006 + \underset{(0.124)}{0.361\ \mathrm{RN}_{t-1}} + \underset{(0.028)}{0.037\ \mathrm{UCAP}_{t-1}} - \underset{(0.022)}{0.009\ \mathrm{UCAP}_{t-2}} + \underset{(0.218)}{0.413\ u_{t-1}}$$

$$\bar{R}^2 = 0.598,\ \mathrm{DWS} = 1.96,\ 1955\text{–}84$$

More complex lag structures for UCAP, including polynomial distributed lags, confirmed this conclusion.

We also considered a variety of alternatives to capacity utilization. Substituting the unemployment rate among adult males left the coefficient of RN essentially unchanged (at 0.445 with a standard error of 0.112) but was itself insignificant (a coefficient of -0.020 with a standard error of 0.075). Substituting a distributed lag in the percentage change in real nonfarm business product (PCNFBP), as suggested by the traditional accelerator model, leaves the coefficient of RN essentially unchanged.

$$(8)\quad I_t/Y_t = 0.011 + \underset{(0.126)}{0.400\ \mathrm{RN}_{t-1}} + \underset{(0.027)}{0.026\ (\mathrm{PCNFBP})_{-1}} + \underset{(0.031)}{0.046\ (\mathrm{PCNFBP})_{-2}} + \underset{(0.028)}{0.034\ (\mathrm{PCNFBP})_{-3}} + \underset{(0.021)}{0.011\ (\mathrm{PCNFBP})_{-4}} + \underset{(0.18)}{0.47\ u_{-1}}$$

$$\bar{R}^2 = 0.590,\ \mathrm{DWS} = 1.97,\ 1954\text{–}84$$

Finally, we experimented with a number of possible additional variables including the ratio of cash flow to GNP, the rate of inflation, and a time trend. The coefficients of these variables were not significant, and the coefficient of the RN variable remained essentially unchanged. A typical example of this specification is presented in equation (9):

$$
(9) \quad I_t^n/Y_t = \underset{}{-0.043} + \underset{(0.074)}{0.372\mathrm{RN}_{t-1}} + \underset{(0.028)}{0.054\ \mathrm{UCAP}_{t-1}} + \underset{(0.194)}{0.106\ (\text{cash flow/GNP})_{t-1}} + \underset{(0.00021)}{0.00028\ \text{time}} - \underset{(0.248)}{0.042\ u_{t-1}}
$$

$$\bar{R}^2 = 0.693 \ \mathrm{DWS} = 1.96,\ 1954\text{–}84$$

We have also reestimated the basic equation using the cyclically adjusted net return, RNA. This variable is constructed by calculating a regression equation relating the pretax profitability to the concurrent rate of capacity utilization and then calculating the pretax return that would have prevailed at a constant rate of capacity utilization. The effective tax rate is then applied to this cyclically adjusted pretax rate of return to obtain the cyclically adjusted net rate of return, RNA. The regression coefficient of this variable is essentially identical to the coefficient of RN in the basic estimate of equation (3):

$$
(10) \quad I_t^n/Y_t = -0.025 + \underset{(0.118)}{0.416\ \mathrm{RNA}_{t-1}} + \underset{(0.021)}{0.048\ \mathrm{UCAP}_{t-1}} + \underset{(0.205)}{0.422\ u_{t-1}}
$$

$$\bar{R}^2 = 0.595,\ \mathrm{DWS} = 1.95,\ 1954\text{–}84$$

Although our analysis focused on the net return after all taxes, we also estimated the basic equations using the rate of return after corporate taxes only. As we explained in section 4.2.1, the return after corporate taxes is the appropriate measure of the attractiveness of investing in nonfinancial corporate capital for tax-exempt investors like pension funds and for foreign investors. Looking at the return after the corporate tax is also appropriate to the extent that changes in personal tax rates have an equal effect on the net return to the competing investments. Equation (11) shows that variations in the rate of return after corporate taxes (RNC) have a slightly stronger effect on the investment–GNP ratio than the RN measure of the net return:

$$(11) \quad I_t^n/Y_t = \underset{}{-0.008} + \underset{(0.104)}{0.455}\,\mathrm{RNC}_{t-1} + \underset{(0.024)}{0.016}\,\mathrm{UCAP}_{t-1} + \underset{(0.221)}{0.276}\,u_{t-1}$$

$\bar{R}^2 = 0.632$, DWS $= 1.85$, 1954–84

The results with the cyclically adjusted measure of the real return net of corporate tax have almost the same coefficient of the net return variable but a stronger effect of the capacity utilization variable:

$$(12) \quad I_t^n/Y_t = -0.044 + \underset{(0.103)}{0.455}\,\mathrm{RNCA}_{t-1} + \underset{(0.020)}{0.061}\,\mathrm{UCAP}_{t-1} + \underset{(0.222)}{0.240}\,u_{t-1}$$

$\bar{R}^2 = 0.626$, DWS $= 1.87$, 1954–84

In both equations, the explanatory power ($\bar{R}^2$) is greater with the RNC variable than with the RN variable. Moreover, since the RNC and RNCA variables are about 40% larger on average than the corresponding RN variables, the elasticity of the investment–GNP ratio with respect to RNC is approximately 0.80.

Finally, we have estimated equations describing the rate of growth of the net capital stock, that is, replacing the ratio of investment to GNP with the ratio of investment to the net capital stock at the end of the preceding year. The results, shown in equation (13), are qualitatively very similar to the basic investment–GNP estimates of equation (3):

$$(13) \quad \frac{I_t^n}{K_{t-1}^n} = -0.21 + \underset{(0.121)}{0.608}\,\mathrm{RN}_{t-1} + \underset{(0.032)}{0.045}\,\mathrm{UCAP}_{t-1} + \underset{(0.241)}{0.138}\,u_{t-1}$$

$\bar{R}^2 = 0.682$, DWS $= 1.91$, 1954–84

The coefficient of RN is nearly 50% larger than the corresponding coefficient in the equations for the investment GNP ratio while the investment-capital ratio averages only about 30% larger than the investment–GNP ratio. Thus the elasticity of the investment-capital ratio with respect to RN, calculated at the mean investment-capital ratio (0.039) and the mean value of RN (0.038), is 0.59, or somewhat greater than the previously calculated elasticity of 0.52 of the investment–GNP ratio with respect to RN.

4.4 The Rate of Return over Cost and the Rate of Investment: Statistical Evidence

The second basic model that we discussed above and that was developed in Feldstein (1982) relates the investment–GNP ratio to the difference between the maximum potential net return on a standard investment project and the net cost of funds that firms face. This model is the operational extension to an economy with taxes of Irving Fisher's (1896, 1930) notion that investment depends on the difference between the marginal efficiency of capital (or the internal rate of return on an incremental investment) and the rate of interest.

In the standard textbook version of this theory, the firm faces a downward sloping marginal-efficiency-of-capital schedule and a horizontal rate-of-interest line. At the point where the two intersect, the firm has an optimal stock of capital. If, however, the marginal efficiency of capital exceeds the rate of interest, the firm has an incentive to invest. Adjustment costs limit the speed with which the firm closes the gap, but the volume of investment can be assumed to be an increasing function of the difference between the marginal efficiency of capital and the rate of interest.

In an economy with complex tax rules, the analog to the marginal efficiency of capital schedule depends on the tax rate, the depreciation rules and investment tax credits, and the rate of inflation, as well as on the pretax profitability of the available investment projects. Each point on the schedule represents the maximum net cost of funds that the firm can afford to pay to support that incremental project. We represent shifts in the level of this entire schedule by the maximum net cost of funds that the firm can afford to pay on a hypothetical "standard" project.

More explicitly, we derive the maximum potential net return (MPNR) on the assumption that the basic investment project is a "sandwich" of equipment and structures that lasts for 30 years and replicates the average mixture of equipment and structures in the capital stock of the nonfinancial corporate sector. The sandwich consists of an initial investment of $.33 of structures and $.33 of equipment. The output associated with the structures is assumed to decay exponentially at a rate of 3% a year; at the end of 34 years, the remaining structure is scrapped without value. The output associated with the equipment decays more rapidly, at 13% per year, and the equipment is scrapped without value at the end of 17 years. After 17 years, a new equipment investment is made with real value (in the prices of year 1) of $.33. This then decays in the same way as the initial equipment investment and is scrapped at the same time as the structure.

The net output values of the structure and equipment components are set for the first year of each project to satisfy 2 conditions. First, the overall pretax return on the investment sandwich is 10.3%, the average pretax return for the period from 1961 to 1984 (or at the pretax return of the current year in the varying profitability model). Second, the after-tax rates of return on the 2 types of capital are equal under the tax rules prevailing in the base period (chosen to be 1960). These conditions uniquely determine a path of net output that we shall denote x_t.

The MPNR is defined as the net rate of return that the firm can pay on the funds "borrowed" (as a loan or an infusion of equity capital) to finance an investment sandwich and can have "paid off" the initially invested funds by the end of the life of the project. More specifically, we consider a project that has annual pretax real net output of x_t per dollar of plant and equipment initially invested and nominal pretax net receipts of $p_t x_t$. The price level of the firm's net output is assumed to vary in proportion to the price level of the economy as a whole. The firm is allowed depreciation deductions for tax purposes of a_t and pays tax on nominal output less interest expenses and depreciation allowances at rate τ. The firm needs initial cash per dollar of the equipment investment equal to \$1 minus the investment tax credit. Thereafter, the "loan" balance (L_t) is reduced by the project's after-tax income but grows by an annual amount equal to the product of the net cost of funds and the previous year's "loan" liability. The value of the rate of return on the "borrowed" funds that permits the "loan" to be just repaid when the project ends defines the maximum potential net return.[20]

The nominal MPNR is thus the value that satisfies the equation

$$L_t = (1 + \text{MPNR})L_{t-1} - (1 - \tau)p_t x_t - \tau a_t \tag{14}$$

subject to the condition that $L_0 = 0.66$ minus the investment tax credit per dollar of equipment investment, that L_{1T} is increased by the net cost of the new equipment investment, and that the loan is repaid when the project is scrapped ($L_T = 0$).

An alternative measure of the MPNR is also calculated on the assumption that firms assume that the real pretax return on prospective investment projects varies from year to year and is equal to the average pretax return actually earned in that year on all nonfinancial corporate capital. This measure is denoted MPNRVP (where the last 2 letters denote varying profitability).

The net cost of funds is taken to be a weighted average of the costs of debt and equity funds. The cost of equity funds (e) is the ratio of adjusted economic earnings per share to the price per share.[21]

The gross cost of debt is the yield on newly issued high grade corporate bonds (i). The net cost of funds is thus

$$\text{COF} = b(1 - \tau)i + (1 - b)e \tag{15}$$

where b is the proportion of investment financed by debt. We take b to be one-third, approximately the average value of the ratio of the market value of debt to the replacement value of the capital stock during the period 1960 to 1984. The annual values of the cost of funds and of its components are presented in table 4.8 (see Appendix B).

An estimated relation of the net investment–GNP ratio to the rate of return over cost (MPNR − COF) and the rate of capacity utilization was presented in Feldstein (1982):

$$\text{(16)} \quad I_t^n/Y_t = \underset{}{-0.040} + \underset{(0.066)}{0.316}\,(\text{MPRN} - \text{COF})_{t-1} + \underset{(0.020)}{0.073}\,\text{UCAP}_{t-1} + \underset{(0.17)}{0.70}\,u_{t-1}$$

$$\bar{R}^2 = = 0.784,\ \text{DWS} = 1.79,\ 1955\text{–}77$$

It should be noted that MPNR − COF = MPRNR − RCOF since MPRNR equals the MPNR minus the rate of inflation and RCOF equals the COF minus the rate of inflation.

Although there were substantial revisions in the national income account data and a number of significant improvements in the process of calculating the MPNR and COF variables, the reestimation of this equation with data for the quarter-century beginning in 1961 produced remarkably similar parameter estimates:

$$\text{(17)} \quad I_t^n/Y_t = -0.044 + \underset{(0.169)}{0.313}\,(\text{MPNR} - \text{COF})_{t-1} + \underset{(0.033)}{0.086}\,\text{UCAP}_{t-1} + \underset{(0.286)}{0.350}\,u_{t-1}$$

$$\bar{R}^2 = 0.510,\ \text{DWS} = 1.74,\ 1961\text{–}84$$

A strong test of this specification is obtained by splitting the return over cost variable into its 2 components. Equation (18) shows that the coefficients of the 2 components do have quite similar absolute values, as implied by the initial specification.

$$\text{(18)} \quad I_t^n/Y_t = -0.012 + \underset{(0.172)}{0.294}\,\text{MPNR}_{t-1} - \underset{(0.185)}{0.394}\,\text{COF}_{t-1} + \underset{(0.033)}{0.058}\,\text{UCAP}_{t-1} + \underset{(0.236)}{0.565}\,u_{t-1}$$

$$\bar{R}^2 = 0.514,\ \text{DWS} = 1.78,\ 1961\text{–}84$$

A second type of evidence that indicates the robustness of the parameter estimates is the fact that very similar coefficients are obtained when the basic specification is estimated by ordinary least squares (i.e., without the first-order autoregressive transformation) or by first-differencing the data before estimation. In the ordinary least squares regression, the coefficient of the return over cost variable is 0.27 with a standard error of 0.15. When the data are first-differenced, the estimates are

$$\text{(19)}\quad \frac{I_t^n}{Y_t} - \frac{I_{t-1}^n}{Y_{t-1}} = \underset{}{0.0005} + \underset{(0.175)}{0.333}\,[(\text{MPNR} - \text{COF})_{t-1}$$
$$- (\text{MPNR} - \text{COF})_{t-2}] + \underset{(0.044)}{0.072}\,[\text{UCAP}_{t-1}$$
$$- \text{UCAP}_{t-2}] - \underset{(0.363)}{0.177}\,u_{t-1}$$
$$\bar{R}^2 = 0.202,\ \text{DWS} = 1.94,\ 1962\text{–}84$$

Splitting the sample produced less satisfactory results, with too little information in each 12-year subperiod to permit accurate estimation of the key parameter values:

$$\text{(20a)}\quad I_t^n/Y_t = -0.083 + \underset{(0.200)}{0.035}\,(\text{MPNR} - \text{COF})_{t-1} + \underset{(0.042)}{0.139}\,\text{UCAP}_{t-1} - \underset{(0.472)}{0.004}\,u_{t-1}$$
$$\bar{R}^2 = 0.567,\ \text{DWS} = 1.56,\ 1961\text{–}72$$
$$\text{SSR} = 0.000222$$

and

$$\text{(20b)}\quad I_t^n/Y_t = -0.056 + \underset{(0.325)}{0.575}\,(\text{MPNR} - \text{COF})_{t-1} + \underset{(0.053)}{0.094}\,\text{UCAP}_{t-1} + \underset{(0.458)}{0.280}\,u_{t-1}$$
$$\bar{R}^2 = 0.248,\ \text{DWS} = 1.74,\ 1973\text{–}84$$
$$\text{SSR} = 0.000329$$

The point estimates imply that the rate of return over cost had a very small and insignificant effect in the first subperiod but a quite powerful effect in the second half of the sample. The coefficients of the capacity utilization variables are much closer to each other. However, a standard F-test shows that the coefficients in the 2 separate subsamples are not significantly different from each other. The sum of squared residuals for the single overall sample in 1961 through 1984 is 0.000609 while the sum of the 2 subsample sums of squared residuals is 0.000551; the resulting F-statistic is only 0.42 while the critical value at the 5% level with 16 and 4 degrees of freedom is 4.49. The difference in the coefficients in equations (20a) and (20b) should therefore only be interpreted as indicating that there is insufficient evidence in the separate subsamples to estimate separate coefficient values.

Different lag distributions did not alter the basic estimates or improve the explanatory power of the equation. Thus a second-order polynomial distributed lag on the coefficients of 4 lagged values of MPNR − COF had coefficients that summed to 0.49 with a standard error of 0.42. Only the first of the coefficients was larger than its standard error; it had a value of 0.33 with a standard error of 0.17. With 2 lagged values for MPNR − COF the estimated equation is

$$(21)\quad \begin{aligned} I_t^n/Y_t = {} & -0.047 + \underset{(0.178)}{0.291}\,(\text{MPNR} - \text{COF})_{t-1} \\ & - \underset{(0.221)}{0.052}\,(\text{MPNR} - \text{COF})_{t-2} \\ & + \underset{(0.039)}{0.092}\,\text{UCAP}_{t-1} + 0.290\,u_{t-1} \end{aligned}$$

$$\bar{R}^2 = 0.480,\ \text{DWS} = 1.69,\ 1962\text{–}84$$

The coefficient of the second MPNR − COF variable is completely insignificant, and the coefficient of the first MPNR − COF variable is very close to the value of 0.313 in the basic equation (17).

Several alternatives to the capacity utilization variable were also considered as different ways of measuring the impact of economic activity on investment. The unemployment rate for adult males (RUM 20 +) worked reasonably well as an alternative to capacity utilization but provided less overall explanatory power:

$$(22)\quad \begin{aligned} I_t^n/Y_t = {} & 0.034 + \underset{(0.190)}{0.443}\,(\text{MPNR} - \text{COF})_{t-1} \\ & - \underset{(0.115)}{0.211}\,\text{RUM20}_{t-1} + \underset{(0.258)}{0.447}\,u_{t-1} \end{aligned}$$

$$\bar{R}^2 = 0.427,\ \text{DWS} = 1.66,\ 1961\text{–}84$$

When a third-degree polynomial distributed lag over 4 annual values of the percentage change in nonfarm business output (with the final value unconstrained) is added to the basic specification, the capacity utilization variable continues to have a coefficient of 0.085 (with a standard error of 0.038) while none of the distributed lag coefficients is as large as its standard error; the sum of the distributed lag coefficients is 0.0010 with a standard error of 0.0014.

Including a variety of additional plausible variables in the equation has little effect on the coefficient of the return over cost variable. For example, the coefficients of the ratio of corporate cash flow to GNP and of a time trend are both insignificant:

$$(23)\quad \begin{aligned} I_t^n/Y_t = {} & -0.056 + \underset{(0.181)}{0.293}\,(\text{MPNR} - \text{COF})_{t-1} \\ & + \underset{(0.075)}{0.091}\,\text{UCAP}_{t-1} + \underset{(0.00056)}{0.00014}\,\text{time} \\ & + \underset{(0.457)}{0.051}\,(\text{cash flow/GNP})_{t-1} + \underset{(0.380)}{0.306}\,u_{t-1} \end{aligned}$$

$$\bar{R}_2 = 0.463,\ \text{DWS} = 1.82,\ 1961\text{–}84$$

In contrast to the MPNR variable that has been used in all the above equations, the MPNRVP variable assumes that firms adjust their assumed pretax rate of return from year to year in proportion to that year's actual pretax profitability of capital in the nonfinancial corporate sector. The standard deviation of the rather volatile MPNRVP − COF variable is twice as high for the period 1960 through 1984 as the standard deviation of the MPNR − COF variable. Moreover, as equation (24) shows, it is statistically insignificant and, when combined with the capacity utilization rate, provides a much less satisfactory explanation of the behavior of the investment–GNP ratio:

$$(24)\quad \begin{aligned} I_t^n/Y_t = {} & -0.051 + \underset{(0.0008)}{0.0005}(\text{MPNRVP} - \text{COF})_{t-1} \\ & + \underset{(0.046)}{0.095}\text{UCAP}_{t-1} + \underset{(0.389)}{0.272}\,u_{t-1} \end{aligned}$$

$$\bar{R}^2 = 0.425,\ \text{DWS} = 1.63,\ 1961\text{–}84$$

Finally, we present an equation relating the growth of the net capital stock (i.e., the ratio of net investment to the net capital stock at the end of the previous year) to the basic rate-of-return-over-cost and capacity-utilization variables:

$$(25)\quad \begin{aligned} \frac{I_t^n}{K_{t-1}^n} = {} & -0.068 + \underset{(0.234)}{0.482}\,(\text{MPNR} - \text{COF})_{t-1} \\ & + \underset{(0.054)}{0.122}\,\text{UCAP}_{t-1} + \underset{(0.323)}{0.351}\,u_{t-1} \end{aligned}$$

$$\bar{R}^2 = 0.555,\ \text{DWS} = 1.80,\ 1961\text{–}84$$

The coefficient of MPNR − COF is some 60% larger than the corresponding coefficient in the equation for the investment–GNP ratio. Since the investment-capital ratio is about 30% greater than the investment–GNP ratio, the coefficient implies a more powerful effect of MPNR − COF on the capital growth rate than on the investment–GNP ratio. Since a similar result was obtained with the real net return model, this method of specifying investment behavior deserves more careful examination in a future study.

4.5 Concluding Comments

The evidence presented in this paper confirms that tax-induced changes in the profitability of investment have had a powerful effect on the share of GNP devoted to net investment in nonresidential fixed capital and on the rate of growth of that net capital stock. More specifically, we have reestimated 2 very simple models of aggregate investment that were previously studied in Feldstein (1982). The present study extends the previous analysis by incorporating revised national income account estimates, by improving the estimation of the effective tax rate and the profitability of new investments, and by extending the sample to include the years 1978 through 1984, a period of very substantial changes in tax rules and sharp shifts in inflation and in the business cycle. Despite all these changes, the new statistical estimates are remarkably close to the previous results.

The statistical estimates imply that each percentage point increase in the real after-tax net return on capital in the nonfinancial corporate sector raises the ratio of net fixed nonresidential investment to GNP by 0.4 percentage points. Since the 22 percentage point decline in the effective tax rate paid by corporations and their shareholders and creditors between 1978–80 (just before the passage of the 1981 tax act) and 1983–84 (the most recent years for which data are available) implies a 1.8 percentage point rise in the real net return, the implied increase in the investment–GNP ratio is approximately 0.7 percentage points. Although it is inappropriate to treat the specific implications of these models as precise predictors of the impact of taxes in any particular short period, the predicted rise in the investment–GNP ratio accords quite well with the observed 0.6 percentage point increase. After taking into account the fall in capacity utilization over this same period, the analysis shows that virtually all the rise in the investment–GNP ratio appears to have been due to the reduction in effective tax rates that occurred because of the decline in inflation and in personal tax rates and to the accelerated depreciation of investment in plant and equipment.

A separate analysis that relates the investment–GNP ratio to the difference between the potential return on new investment and the cost of funds also shows the importance of changes in taxes as a cause of changes in the investment–GNP ratio over the past quarter-century. Each percentage point rise in the difference between the potential return on new investment and the cost of funds raises the predicted investment–GNP ratio by 0.3 percentage points. Between 1979–81 and 1984–85, the maximum potential real return on new investment rose by 1.3 percentage points, implying a 0.4% of GNP rise in investment.

Although this model is not as successful as the net return model in explaining year-to-year variations in the investment–GNP ratio in general, and the experience between 1980 and 1985 in particular, it does imply that changes in the return on new investment and in the cost of funds do have powerful effects on the investment–GNP ratio. It also shows that about two-thirds of the increase in investment that might have resulted from the improved after-tax profitability between 1978–80 and 1984 was offset by the rise in the cost of funds during the same period. All of this increase in the cost of funds was in the cost of debt. Therefore, to the extent that the increase in expected budget deficits caused the rise in interest rates, it had the effect of offsetting a large part of the increased incentive to invest that resulted from the change in tax rules.

The 3 alternative models of investment behavior all imply that the types of tax changes proposed by the Reagan administration or passed by the House of Representatives would significantly depress the ratio of investment to GNP. Depending on the particular statistical specification, the Administration proposal would reduce the investment–GNP ratio by between 20% and 40% of the increase experienced between 1979–81 (before the 1981 change in tax rules) and 1984–85. The bill passed by the House of Representatives would reduce investment by substantially more.

A high priority now is to reestimate the analysis of this paper with the revised national income and product account data released in December 1985. It is also possible to extend the present analysis in a number of ways. The relation between investment and the net return after corporate taxes but before personal and other portfolio taxes should be analyzed further. Additional attention should also be given to analyzing the rate of growth of the net capital stock as well as or instead of the investment–GNP ratio. The process of replacement and modernization investment also deserves more explicit analysis in this framework. The flexible accelerator models of Jorgenson (1963) and Hall and Jorgenson (1967) and the marginal -q models of Abel (1984), Summers (1981), and Hayashi (1982) should also be estimated.[22] Finally, a disaggregation of investment by types of assets and by industry may also improve our understanding of the investment process and of the impact of changes in tax rules.

Appendix A
The Pretax Rate of Return and Effective Tax Rates

This appendix presents annual data for 1953 through 1984 on the investment rate, capacity utilization, pretax and net-of-tax rates of return, and effective tax rates. Our procedures for estimating these magnitudes from data published by the Commerce Department, the Federal Reserve Board, and the Internal Revenue Service are described.

Our method follows the procedure used in Feldstein, Poterba, and Dicks-Mireaux (1983) but makes some modifications that we believe provide better estimates of both the pretax return and effective tax rates. The calculations use the most recent data available in the fall of 1985. This means that the December 1985 benchmark revisions of the national income and product accounts and the subsequent changes adopted by the Federal Reserve Board for the flow of funds accounts are not incorporated.

All of our estimates of the pretax rate of return and of the effective tax rates are for nonfinancial corporations. Nonresidential fixed investment includes all sectors of the economy. The capacity utilization measure is the Federal Reserve Board's estimate for the manufacturing industries.

The columns of table 4.4 present the following annual values: column 1, the ratio of net investment in nonresidential fixed capital to gross national product; column 2, the ratio of net investment in nonresidential fixed capital to the net stock of nonresidential fixed capital at the end of the previous year; column 3, the capacity utilization rate in manufacturing industry; column 4, the pretax real rate of return on capital in the nonfinancial corporate sector; column 5, the real rate of return on capital in the nonfinancial corporate sector after all taxes paid by corporations, their shareholders, and their creditors; column 6, the real rate of return on capital in the nonfinancial corporate sector after all taxes paid by corporations; column 7, the cyclically adjusted real rate of return on capital in the nonfinancial corporate sector after all taxes; and column 8, the cyclically adjusted real rate of return on capital in the nonfinancial corporate sector after all corporate taxes. The first 2 series are calculated directly from data published by the Commerce Department. The data in column 3 are published by the Federal Reserve

Table 4.4 **Investment and the Real Net Rate of Return**

Year	Investment–GNP Ratio (I_n/Y) (1)	Growth of Capital Stock (I_n/K^n_{t-1}) (2)	Capacity Utilization (UCAP) (3)	Pretax Real Return (R) (4)	Net Rate of Return: After All Taxes (RN) (5)	Net Rate of Return: After Corporate Taxes (RNC) (6)	Cyclically Adjusted Return: After All Taxes (RNA) (7)	Cyclically Adjusted Return: After Corporate Taxes (RNCA) (8)
1953	0.028	0.041	0.893	0.114	0.031	0.043	0.027	0.038
1954	0.024	0.033	0.801	0.105	0.032	0.045	0.033	0.046
1955	0.029	0.041	0.870	0.129	0.043	0.058	0.040	0.054
1956	0.031	0.044	0.862	0.110	0.030	0.045	0.028	0.042
1957	0.030	0.041	0.836	0.102	0.031	0.044	0.030	0.042
1958	0.018	0.023	0.750	0.089	0.028	0.040	0.032	0.045
1959	0.021	0.029	0.817	0.110	0.038	0.051	0.038	0.051
1960	0.024	0.032	0.802	0.102	0.036	0.048	0.037	0.049
1961	0.021	0.028	0.773	0.103	0.037	0.049	0.040	0.053
1962	0.025	0.034	0.814	0.116	0.047	0.061	0.047	0.061
1963	0.026	0.035	0.835	0.125	0.052	0.067	0.051	0.065

1964	0.031	0.043	0.857	0.134	0.060	0.075	0.057	0.071
1965	0.042	0.059	0.896	0.146	0.068	0.084	0.062	0.076
1966	0.047	0.066	0.911	0.144	0.065	0.082	0.057	0.072
1967	0.040	0.054	0.868	0.131	0.059	0.075	0.055	0.070
1968	0.039	0.051	0.870	0.130	0.050	0.069	0.047	0.064
1969	0.041	0.053	0.867	0.116	0.039	0.059	0.036	0.055
1970	0.035	0.043	0.792	0.095	0.031	0.049	0.032	0.051
1971	0.029	0.036	0.774	0.102	0.036	0.054	0.039	0.059
1972	0.031	0.039	0.828	0.108	0.041	0.059	0.040	0.058
1973	0.040	0.051	0.870	0.105	0.036	0.055	0.033	0.050
1974	0.035	0.042	0.826	0.080	0.012	0.035	0.012	0.035
1975	0.019	0.021	0.723	0.086	0.027	0.047	0.033	0.056
1976	0.020	0.023	0.774	0.095	0.033	0.050	0.036	0.054
1977	0.027	0.032	0.815	0.099	0.035	0.055	0.035	0.055
1978	0.034	0.042	0.842	0.095	0.032	0.052	0.031	0.050
1979	0.037	0.045	0.846	0.082	0.026	0.044	0.025	0.042
1980	0.030	0.035	0.793	0.070	0.019	0.037	0.021	0.040
1981	0.032	0.036	0.783	0.077	0.029	0.047	0.032	0.052
1982	0.023	0.025	0.703	0.067	0.030	0.045	0.040	0.059
1983	0.022	0.025	0.740	0.080	0.041	0.054	0.048	0.064
1984	0.037	0.046	0.808	0.099	0.054	0.070	0.056	0.071

Board. The method of calculating the remaining columns is discussed in the remainder of this appendix.

The Pretax Rate of Return

The pretax rate of return is calculated as the ratio of the total pretax capital income of the nonfinancial corporate sector to the replacement value of that capital stock including fixed capital, land, and inventories. The Federal Reserve Board's *Balance Sheets for the United States, 1945–84* presents year-end values for these components. We average values for the end of the previous year and the end of the current year to obtain an average value of the capital stock during the year. These capital stock values are reported in column 1 of table 4.5.

The pretax capital income of the nonfinancial corporate sector consists of four basic components: (1) corporate profits with the capital consumption adjustment and inventory valuation adjustment; (2) net interest paid by the corporations; (3) the property taxes paid to state and local governments; and (4) the inflation-induced changes in the value of the net financial liabilities of the nonfinancial corporations other than the liabilities to those who are providers of capital to the corporations. Each of these components will now be explained and the time series presented in table 4.5.

Corporate profits with the capital consumption adjustment and inventory valuation adjustment are the basic data provided by the Department of Commerce as their national income account measure of the inflation-adjusted pretax profits. This series is presented in column 2 of table 4.5.

Since we want the return to all providers of capital, we must add to these profits the net interest payments of nonfinancial corporations. These data are also from the national income accounts. Note that these are nominal interest payments since any inflation-induced loss to the creditors is a gain to the equity owners and leaves total real capital income unchanged. The net interest payments are shown in column 3 of table 4.5.

The Commerce Department treats state and local property taxes as a cost of production rather than a tax on capital. We therefore add this tax to the other components of capital income to obtain a more correct estimate of the return to capital. Since data are not available on the state and local property tax paid by nonfinancial corporations, we estimate that the ratio of these taxes to all state and local property taxes is the same as the ratio of the fixed capital of nonfinancial corporations to the total fixed capital of the private sector other than the nonprofit sector. This method is subject to a variety of potential biases since it (1) assumes that nonfinancial corporate capital and other capital are

Table 4.5 **The Pretax Rate of Return on Nonfinancial Corporate Capital (in billions of dollars)**

Year	Capital Stock (1)	Corporate Profits with CCA and IVA (2)	Net Interest Paid (3)	State and Local Property Taxes (4)	Inflation Gain on Miscellaneous Net Liabilities (5)	Total Capital Income (6)	Real Pretax Rate of Return (7)
1953	299.427	—	1.275	2.823	−0.084	34.063	0.114
1954	310.174	—	1.550	2.994	−0.509	32.585	0.105
1955	328.526	—	1.600	3.216	−0.826	42.440	0.129
1956	362.339	—	1.750	3.568	−1.175	39.892	0.110
1957	393.023	—	2.175	3.970	−0.780	40.215	0.102
1958	409.466	—	2.700	4.286	−0.534	36.577	0.089
1959	425.132	40.125	3.125	4.506	−0.832	46.924	0.110
1960	442.201	37.350	3.475	4.843	−0.524	45.143	0.102
1961	455.687	38.250	3.925	5.143	−0.059	46.959	0.103
1962	472.839	45.575	4.525	5.527	−0.755	54.873	0.116
1963	491.374	51.250	4.775	5.955	−0.556	61.425	0.125
1964	512.545	57.700	5.275	6.395	−0.536	68.834	0.134
1965	546.146	67.700	6.050	6.921	−0.952	79.719	0.146
1966	595.641	72.150	7.375	7.488	−1.380	85.633	0.144
1967	650.105	68.825	8.750	8.414	−1.100	84.889	0.131
1968	701.417	73.225	10.075	9.387	−1.723	90.964	0.130
1969	765.263	67.475	13.100	10.342	−1.989	88.928	0.116

(*continued*)

Table 4.5 (continued)

Year	Capital Stock (1)	Corporate Profits with CCA and IVA (2)	Net Interest Paid (3)	State and Local Property Taxes (4)	Inflation Gain on Miscellaneous Net Liabilities (5)	Total Capital Income (6)	Real Pretax Rate of Return (7)
1970	837.431	52.675	16.975	11.826	−1.749	79.727	0.095
1971	898.534	62.150	18.000	13.118	−1.747	91.521	0.102
1972	963.715	72.700	19.075	13.781	−1.750	103.807	0.108
1973	1,075.446	78.625	23.025	14.431	−2.845	113.236	0.105
1974	1,289.332	63.575	29.650	15.528	−5.818	102.935	0.080
1975	1,481.256	86.075	30.800	17.340	−6.151	128.064	0.086
1976	1,597.678	107.275	29.550	18.622	−4.158	151.289	0.095
1977	1,761.203	129.475	32.125	19.472	−5.919	175.154	0.099
1978	1,984.841	142.050	36.875	18.726	−8.788	188.864	0.095
1979	2,276.362	134.700	43.900	18.412	−9.339	187.673	0.082
1980	2,611.250	120.275	56.275	19.566	−12.919	183.197	0.070
1981	2,937.722	147.450	67.375	22.071	−11.546	225.350	0.077
1982	3,152.104	118.075	72.300	24.730	−5.448	209.657	0.067
1983	3,262.572	170.950	69.00	26.669	−4.991	261.628	0.080
1984	3,417.042	234.700	79.500	28.895	−5.207	337.888	0.099

taxed at the same effective rates, probably causing an understatement of the tax on nonfinancial corporations; (2) ignores the tax on inventories, causing a further understatement; but (3) ignores the tax that some states levy on consumer durables, which offsets some of the downward bias. The estimated tax is shown in column 4 of table 4.5.

The final adjustment is for the corporations' inflation-induced gains and losses on financial assets and liabilities which are appropriately excluded from the net capital provided to the nonfinancial corporate sector by individuals and other portfolio investors. The net loss of the nonfinancial corporations is equal to the inflation rate multiplied by the sum of (1) the outstanding net trade credit (a nominal asset of the nonfinancial corporations), (2) federal government securities less net amounts owed to the federal government; and (3) state and local government securities less net amounts owed to these governments. Unfortunately, currency is not reported and therefore cannot be included. The inflation rate is computed as the fourth quarter to fourth quarter change in the GNP deflator, and the financial assets and liabilities are estimated as the average of the values for the end of the year and the end of the previous year. The net gain is shown in column 5 of table 4.5.

Adding all these together gives the total income produced by the capital of the nonfinancial corporate sector. This is shown in column 6 of table 4.5.

Dividing the total capital income by the capital stock of column 1 yields the pretax real return shown in column 7 of table 4.5.

The Effective Tax Rates

The tax on the capital income of the nonfinancial corporate sector includes the taxes paid by the corporations themselves (to the federal government and to state and local governments) and the taxes paid by those who receive dividend income, interest income, and capital gains. Since we are interested in deriving the overall effective tax rate on this capital income rather than tax rates on each component, we shall express each component of the overall tax rate as a proportion of the pretax capital income shown in column 6 of table 4.5. Some intermediate effective tax rates used in the calculation are shown in table 4.5.

The federal corporate tax payments as a proportion of pretax capital income are shown in column 1 of table 4.6. The corresponding state and local corporate tax payments are shown in column 2. The state and local property taxes discussed above and presented in column 4 of table 4.4 are expressed as a fraction of the pretax capital income in column 3 of table 4.5. Adding together these 3 columns gives the total taxes paid by the corporations themselves as a fraction of their pretax capital income. This figure is presented in column 4 of table 4.6.

Table 4.6 Components of the Effective Tax Rate on the Capital Income of Nonfinancial Corporations

Year	Federal Corporate Tax (1)	State and Local Corporate Tax (2)	State and Local Property Tax (3)	Total Tax at Corporate Level (4)	Tax on Dividends (5)	Tax on Real Capital Gains (6)	Tax on Nominal Capital Gains (7)	Tax on Interest (8)	Total Effective Tax Rate (9)
1953	0.521	0.022	0.083	0.626	0.086	0.006	0.003	0.010	0.732
1954	0.459	0.021	0.092	0.572	0.090	0.009	0.008	0.013	0.692
1955	0.457	0.021	0.076	0.554	0.080	0.013	0.011	0.010	0.668
1956	0.478	0.024	0.089	0.591	0.091	0.010	0.025	0.012	0.729
1957	0.452	0.023	0.099	0.573	0.091	0.009	0.011	0.016	0.700
1958	0.417	0.023	0.117	0.557	0.099	0.007	0.001	0.021	0.686
1959	0.420	0.022	0.096	0.538	0.082	0.011	0.003	0.019	0.654
1960	0.401	0.023	0.107	0.532	0.088	0.009	0.001	0.022	0.651
1961	0.390	0.023	0.110	0.523	0.086	0.009	0.001	0.024	0.643
1962	0.353	0.024	0.101	0.477	0.077	0.013	0.003	0.024	0.594
1963	0.347	0.023	0.097	0.468	0.077	0.013	0.001	0.022	0.581
1964	0.325	0.023	0.093	0.441	0.068	0.015	0.005	0.021	0.550
1965	0.319	0.022	0.087	0.428	0.064	0.016	0.005	0.020	0.533

1966	0.322	0.023	0.087	0.432	0.065	0.017	0.014	0.024	0.551
1967	0.302	0.025	0.099	0.425	0.070	0.015	0.010	0.029	0.550
1968	0.338	0.029	0.103	0.470	0.074	0.014	0.018	0.035	0.611
1969	0.341	0.032	0.116	0.489	0.074	0.018	0.034	0.048	0.662
1970	0.304	0.035	0.148	0.487	0.079	0.013	0.030	0.069	0.678
1971	0.290	0.035	0.143	0.468	0.068	0.016	0.033	0.061	0.647
1972	0.284	0.039	0.133	0.456	0.063	0.017	0.026	0.056	0.619
1973	0.311	0.042	0.127	0.480	0.059	0.019	0.037	0.062	0.658
1974	0.357	0.051	0.151	0.559	0.067	0.015	0.117	0.092	0.850
1975	0.277	0.045	0.135	0.458	0.065	0.018	0.065	0.079	0.684
1976	0.298	0.051	0.123	0.471	0.066	0.015	0.036	0.063	0.652
1977	0.288	0.052	0.111	0.451	0.063	0.020	0.057	0.058	0.648
1978	0.304	0.051	0.099	0.453	0.069	0.022	0.057	0.062	0.663
1979	0.312	0.056	0.098	0.467	0.076	0.013	0.051	0.074	0.682
1980	0.303	0.062	0.107	0.473	0.086	0.011	0.052	0.105	0.726
1981	0.230	0.054	0.098	0.381	0.085	0.011	0.037	0.107	0.622
1982	0.162	0.049	0.118	0.329	0.082	0.006	0.008	0.121	0.547
1983	0.175	0.047	0.102	0.324	0.068	0.010	0.005	0.086	0.492
1984	0.166	0.043	0.086	0.296	0.058	0.012	0.005	0.077	0.449

To estimate the tax on dividend income, we begin by using the Flow of Funds data on equity ownership to distribute dividends among classes of investors: individuals, nonprofit organizations, insurance companies, banks, pensions, and so forth. The largest class of investors is individuals, whom we assume account for 93% of the dividends received by the household sector. To obtain an effective tax rate on the dividends received by individuals, we have updated the series originally prepared by Brinner and Brooks (1981). The effective federal dividend tax is constructed as a weighted average of individual tax rates, using the fraction of dividends received each year by each income class and the corresponding statutory marginal tax rate. A state dividend tax series is calculated using the assumption that the net marginal tax rate on dividends is 1.5 times the average state personal tax rate implied by the national income account aggregates. Columns 1 and 2 of table 4.7 show the effective federal and state taxes on individual dividend income; these tax rates are expressed as percentages of dividend income. We further assume that dividends received by nonprofit organizations, pension funds, foreign equity owners, and other miscellaneous investors are untaxed. Insurance companies and banks pay a tax equal to 15% of the corporate tax rate. The appropriate weighted average of these tax rates is the effective tax rate on dividend income and is shown in column 3 of table 4.7. Multiplying this number by the total dividends paid by nonfinancial corporations and dividing by the pretax capital income of those corporations yields the tax on dividends as a proportion of pretax capital income; this component of the overall effective tax rate on pretax capital income is shown in column 5 of table 4.6.

The effective tax on capital gains also reflects the distribution of the ownership of corporate equity and the further fact that capital gains are only taxed when assets are sold. The distribution of equity ownership is again based on the Flow of Funds data on the distribution of dividends among different classes of investors and the Internal Revenue Service data on the distribution of dividend income among different income classes. For the sample years before 1969, individual capital gains were taxed when realized at half the individual's statutory rate on dividends but subject to an "alternative" maximum rate of 25%. For the years between 1969 and 1978, the effective tax rate on capital gains was raised in a number of ways: the use of the alternative tax was limited, the value of the loss-offset was reduced, the "untaxed" portion of capital gains was subject to a minimum tax, and the amount of ordinary income eligible for the maximum tax on personal services income was reduced in relation to the amount of the "untaxed" portion of realized capital gains. In 1978 legislation was passed that substantially reduced the effective tax on realized capital gains, and this happened again in 1985. Throughout all of the period, the principle was

Table 4.7 **Effective Tax Rates on Selected Components of Capital Income**

						Tax Rate on Equity Capital Income	
Year	Federal Tax on Dividends (1)	State Tax on Dividends (2)	Tax on Dividends (3)	Total Capital Gains (4)	Tax on Interest (5)	Corporate Taxes Not Imputed (6)	Corporate Taxes Imputed (7)
1953	0.437	0.018	0.398	0.050	0.279	0.749	0.675
1954	0.436	0.019	0.398	0.050	0.277	0.713	0.645
1955	0.444	0.020	0.404	0.049	0.278	0.683	0.615
1956	0.441	0.022	0.401	0.049	0.281	0.750	0.674
1957	0.431	0.023	0.392	0.049	0.289	0.724	0.650
1958	0.428	0.024	0.389	0.048	0.289	0.717	0.645
1959	0.425	0.026	0.386	0.048	0.292	0.680	0.606
1960	0.415	0.027	0.375	0.048	0.292	0.681	0.593
1961	0.424	0.029	0.382	0.048	0.292	0.676	0.589
1962	0.415	0.030	0.373	0.048	0.290	0.622	0.539
1963	0.417	0.031	0.374	0.048	0.288	0.606	0.517
1964	0.380	0.033	0.342	0.048	0.278	0.573	0.481
1965	0.364	0.033	0.327	0.047	0.270	0.555	0.460
1966	0.369	0.035	0.331	0.047	0.278	0.577	0.486
1967	0.378	0.038	0.339	0.047	0.285	0.580	0.491
1968	0.392	0.042	0.352	0.047	0.312	0.648	0.540

(continued)

Table 4.7 (continued)

						Tax Rate on Equity Capital Income	
Year	Federal Tax on Dividends (1)	State Tax on Dividends (2)	Tax on Dividends (3)	Total Capital Gains (4)	Tax on Interest (5)	Corporate Taxes Not Imputed (6)	Corporate Taxes Imputed (7)
1969	0.385	0.045	0.345	0.067	0.324	0.721	0.608
1970	0.383	0.048	0.339	0.067	0.323	0.773	0.653
1971	0.386	0.052	0.338	0.066	0.311	0.729	0.610
1972	0.378	0.059	0.327	0.065	0.306	0.690	0.572
1973	0.379	0.057	0.319	0.065	0.305	0.748	0.623
1974	0.393	0.057	0.323	0.064	0.319	1.066	0.940
1975	0.394	0.060	0.322	0.064	0.329	0.797	0.708
1976	0.407	0.063	0.333	0.064	0.321	0.732	0.638
1977	0.423	0.065	0.343	0.064	0.314	0.723	0.633
1978	0.431	0.065	0.346	0.064	0.316	0.747	0.655
1979	0.455	0.063	0.360	0.046	0.316	0.793	0.700
1980	0.453	0.065	0.359	0.045	0.342	0.897	0.810
1981	0.453	0.065	0.358	0.037	0.359	0.734	0.662
1982	0.373	0.068	0.301	0.037	0.352	0.649	0.572
1983	0.357	0.072	0.285	0.037	0.324	0.552	0.484
1984	0.339	0.071	0.275	0.037	0.329	0.486	0.416

maintained of taxing capital gains only when assets were sold and permitting a step-up in basis when assets were transferred at death.

It is not possible to provide an accurate evaluation of the appropriate weighted average tax rate on capital gains for every year in our sample. Instead, we make the conservative assumption that households paid an effective tax of only 5% on accruing capital gains for the years through 1968, 7.5% in 1969 through 1978, 5% in 1979 and 1980, and then 4% in 1981 through 1984. Banks and insurance companies are taxed at a 30% statutory rate on capital gains realizations. Because of the effect of deferral, we assume that this is equivalent to an effective 15% rate. We assume that all other equity holders pay no capital gains taxes. The overall effective tax rate on capital gains is shown in column 4 of table 4.7.

To translate this capital gains tax rate into taxes as a share of the total pretax income, we must estimate the annual value of capital gains. It is convenient to estimate 2 kinds of capital gains separately: the real gains and the nominal gains that result from inflation. To calculate the real capital gains, we combine the real retained earnings of nonfinancial corporations and the real inflation-induced gain that equity owners make at the expense of creditors. This inflation-induced gain is calculated as the product of the rise in the price level (the increase in the GNP deflator from the fourth quarter of the preceding year to the fourth quarter of the year in question) and the market value of the debt of nonfinancial corporations.[23] Multiplying this amount of real capital gains by the effective tax rate on capital gains and dividing the product by the total capital income of the nonfinancial corporate sector yields the real capital gains component of the overall effective tax rate shown in column 6 of table 4.6.

To calculate the additional nominal capital gain associated with the nominal increase in the value of corporate assets that results from a general rise in the price level, we abstract from the year-to-year fluctuations in stock market values and calculate the nominal rise in the replacement value of the capital stock.[24] To measure changes in the nominal value of the capital stock, we have constructed a price index for the tangible assets of nonfinancial corporations as a weighted average of the nonfarm business price deflator (for inventories) and the price deflator for gross domestic fixed investment. The fourth quarter to fourth quarter change in this price index is multiplied by the nominal value of the tangible assets to get the nominal increase in the value of the capital stock of the nonfinancial corporations. This nominal capital gain is multiplied by the effective tax rate on capital gains (column 4 of table 4.7) to obtain the nominal capital gains component of the overall effective tax rate shown in column 7 of table 4.6.

The final component of the effective tax rate is the tax paid on the interest received by the creditors of the nonfinancial corporations. We understate this tax rate by ignoring the state and local taxes on interest income. To obtain the federal effective tax rate on interest income, we calculate a weighted average of the tax rates of the different providers of debt capital to the nonfinancial corporations, using the fixed weights for 1976 derived from the Flow of Funds data by Feldstein and Summers (1979).[25] We follow the Feldstein-Summers procedure of setting the household tax rate on interest income at 35%, the mutual savings bank rate at 24%, and the rate for private pensions, government accounts, and "miscellaneous creditors" at zero. In computing the marginal tax rate for life insurance companies, we have followed Warshawsky (1982) in approximating the Menge formula by the product of the federal corporate statutory rate and the factor 0.15 + 8.5 times the difference between the Baa corporate bond rate and the average interest rate assumed for life insurance reserves. Finally, for commercial banks we assume that two-thirds of the interest received is taxed at the statutory corporate tax rate while the remaining one-third avoids all corporate tax; the income net of corporate tax is then taxed at a weighted average of the dividend tax rate and the capital gains tax rate with weights reflecting the dividend payout rate of the banks. The combined effective tax rate on interest income is shown in column 5 of table 4.7. The product of this rate and the interest payments of the nonfinancial corporations divided by the total capital income of the nonfinancial corporations gives the interest component of the overall effective tax rate shown in column 8 of table 4.6. All of these numbers are combined in the final effective tax rate shown in column 9 of table 4.6.

As a matter of interest, we also calculate two alternative estimates of the effective tax rate on the equity income of nonfinancial corporations. The first of these is calculated on the assumption that the providers of debt capital bear only the tax that is levied on interest income, that is, the tax shown in column 8 of table 4.6. The second alternative assumes that the taxes paid by the corporations fall equally on debt and equity capital.

The first effective tax rate on equity capital income is therefore defined as the ratio of all taxes paid other than the tax on interest income to all capital income other than interest payments. Operationally, the numerator is the product of the total capital income (column 6 of table 4.5) and the difference between the total effective tax rate (column 9 of table 4.6) and the interest component of that tax rate (column 8 of table 4.5). The denominator is the difference between the total capital income (column 6 of table 4.5) and the interest paid to creditors (column 3 of table 4.5). The resulting effective tax rate on equity income is shown in column 6 of table 4.7.

The alternative procedure is to impute to the providers of debt capital a share of the taxes paid by the corporations (columns 1 through 3 of table 4.6) equal to the ratio of the market value of the debt to the replacement value of the capital stock. The numerator of the equity tax rate is then equal to the numerator described in the previous paragraph minus the imputed tax paid by creditors. The denominator is the same as before. The resulting effective tax rate on equity income with imputed corporate taxes is shown in column 7 of table 4.7.

Appendix B
The Maximum Potential Net Return and the Cost of Funds

Table 4.8 presents annual values of the basic variables used in the rate of return over cost models of section 4.4 and summarized and discussed in section 4.2.

Column 1 shows the maximum potential net return calculated according to the method described in section 4.4. The expected inflation series used in this calculation are derived by a "rolling" estimation of an ARIMA process (using only those data available as of each date), using the estimated coefficients to project inflation for the next 10 years, and calculating the weighted average of those inflation rates. These expected inflation rates are shown in column 2 of table 4.8.

The maximum potential real net return (MPRNR) is the difference between the MPNR value of column 1 and the expected inflation value of column 2. It is shown in column 3.

The MPNR value is calculated assuming a constant 10.3% real pretax return on capital of the nonfinancial corporations. The "varying profitability" alternative, MPNRVP, for each year is calculated with the assumption that the future pretax profitability will be the real pretax return on capital observed that year and shown in column 7 of table 4.5. Subtracting expected inflation from the MPNRVP yields the maximum potential real net return with varying profitability (MPRNRVP) series shown in column 4 of table 4.8.

The cost of funds to which the MPNR series is compared in evaluating the incentive to invest is a weighted average of the cost of equity capital and the net-of-tax cost of debt capital. We calculate the cost of equity capital as the ratio of adjusted earnings to the share price. The starting point of this calculation is the Standard and Poor's price-earnings ratio for industrial companies. We then multiply this by the ratio of estimated aggregate net-of-tax book earnings to estimated net aggregate

Table 4.8 The Maximum Potential Net Return and the Cost of Funds

Year	MPNR (1)	Expected Inflation (2)	MPRNR (3)	MPRNRVP (4)	Adjusted Earnings-Price Variable (5)	Interest Rate (6)	Corporate Tax Rate (7)	Cost of Funds (8)
1960	0.065	0.022	0.043	0.044	0.048	0.047	0.520	0.054
1961	0.064	0.021	0.043	0.048	0.044	0.044	0.520	0.050
1962	0.078	0.021	0.057	0.066	0.048	0.042	0.520	0.053
1963	0.077	0.020	0.057	0.069	0.055	0.052	0.520	0.057
1964	0.082	0.017	0.065	0.080	0.053	0.044	0.500	0.055
1965	0.083	0.016	0.067	0.087	0.055	0.045	0.480	0.055
1966	0.085	0.018	0.067	0.083	0.063	0.054	0.480	0.064
1967	0.073	0.021	0.052	0.064	0.062	0.058	0.480	0.066
1968	0.071	0.027	0.044	0.054	0.055	0.065	0.528	0.065
1969	0.085	0.033	0.052	0.055	0.058	0.077	0.528	0.072
1970	0.081	0.037	0.044	0.042	0.056	0.085	0.492	0.076
1971	0.084	0.040	0.044	0.049	0.052	0.074	0.480	0.074
1972	0.100	0.041	0.059	0.061	0.050	0.072	0.480	0.073
1973	0.103	0.045	0.058	0.053	0.057	0.077	0.480	0.081
1974	0.125	0.075	0.050	0.031	0.072	0.090	0.480	0.114
1975	0.148	0.097	0.051	0.052	0.072	0.090	0.480	0.128
1976	0.118	0.058	0.060	0.060	0.063	0.083	0.480	0.095
1977	0.120	0.060	0.060	0.057	0.071	0.081	0.480	0.101
1978	0.123	0.064	0.059	0.049	0.087	0.089	0.480	0.116
1979	0.131	0.070	0.061	0.040	0.089	0.099	0.460	0.123
1980	0.135	0.076	0.059	0.036	0.076	0.125	0.460	0.123
1981	0.152	0.080	0.072	0.055	0.080	0.150	0.460	0.133
1982	0.145	0.070	0.075	0.061	0.077	0.139	0.460	0.123
1983	0.131	0.056	0.075	0.068	0.066	0.116	0.460	0.102
1984	0.128	0.055	0.073	0.072	0.084	0.123	0.460	0.115

economic earnings. Net aggregate book earnings are derived from the national income account estimate of the net profits of nonfinancial corporations before the capital consumption adjustment and inventory valuation adjustment by adding the sum of (1) the tax rate times the acceleration component of the capital consumption allowance, plus (2) the difference between the investment tax credit and an average of the ITC of the past 10 years. Aggregate economic earnings are derived from the national income account estimate of the profits of nonfinancial corporations after the capital consumption adjustment and inventory valuation adjustment by adding an estimate of the gain that equity owners make at the expense of creditors (referred to in connection with column 6 of table 4.6) and the gain made on miscellaneous net liabilities (column 5 of table 4.5). The resulting adjusted earnings price ratio is presented in column 5 of table 4.8.

The gross cost of debt funds is represented by the interest rate on high grade corporate bonds calculated by Data Resources, Inc. This is shown in column 6 of table 4.8.

Because the MPNR and MPRNR variables are net concepts, the cost of funds must also be measured as a net of the corporate tax deduction for interest expenses. Column 7 is the statutory corporate tax rate against which interest expenses are deducted.

The nominal cost of funds is defined as a weighted average of the nominal cost of equity capital (the earnings price ratio of column 5 plus the expected inflation rate of column 2) and the nominal net cost of debt capital (the product of the interest rate of column 6 and the 1 minus the corporate tax rate of column 7) with a weight of one-third on debt and two-thirds on equity. The resulting cost of funds variable is presented in column 8 of table 4.8.

Notes

1. A similar measure of the combined corporate-personal tax burden was first derived by Feldstein and Summers (1979) and is updated in Appendix A on the basis of revised data and an improved procedure.

2. Feldstein (1983) contains several papers that discuss this interaction of inflation, tax rules, and capital formation.

3. *The Budget of the United States for Fiscal Year 1986* projected corporate tax receipts of $99 billion in 1988 under current law and indicated that the original ERTA provisions would, on the basis of 1985 economic projections, have reduced 1988 corporate receipts by $55 billion. See pages 4-2 and 4-7 of Office of Management and Budget (1985).

4. This assumes a 4% real discount rate. With a 10% real discount rate, the corresponding present value rises from 41.8 cents to 45.2 cents. With the slower depreciation rules of the pre–ERTA tax law, the increases are greater: from

41.2 cents to 46.2 cents with a 4% real discount rate and from 37.2 cents to 41.2 cents with a 10% real discount rate. These figures are taken from *The Economic Report of the President for 1983*.

5. By contrast, the 1988 personal tax increases in TEFRA were only $19 billion, or 8% of the original ERTA personal tax reductions. These figures are from *The Budget of the United States for Fiscal Year 1986*.

6. The data in table 4.1 and all other data presented and used in this paper are based on the national income and product accounts (NIPA) that became available in the fall of 1985. The December 1985 benchmark revisions of the NIPA are not reflected in any of the current analysis since information on the net capital stock, net investment, and other key variables was not available by the end of 1985. The data for 1985 refer to only the first 3 quarters of the year since data for the fourth quarter is not available on the old NIPA basis.

7. There is substantial literature on replacement and modernization investment (see Feldstein and Rothschild 1974, Feldstein and Foot 1971, and the work cited therein). This specification of investment in terms of achieving a desired net capital stock has, of course, been characteristic of most modern econometric research on investment; see, for example, Jorgenson (1963), Hall and Jorgenson (1967), Nickell (1978), Abel (1980, 1984), and Summers (1981).

8. Bosworth's analysis must be done in terms of gross investment because the Department of Commerce does not produce data on net investment in autos and computers.

9. The variable in column 2 is the Federal Reserve Board's measure of the capacity utilization rate in manufacturing industry. The more general total industry capacity utilization rate would in principle be a better variable for the present purpose but was never constructed for the years before 1967. Feldstein (1982) showed that additional variables measuring fluctuations in demand (e.g., past changes in sales, available retained earnings or cash flow, or the rate of unemployment) do not increase the explanatory power of investment equations of the type studied here when the manufacturing capacity utilization rate is already included. Similar evidence for the more recent sample is presented below.

10. Our calculation of the pretax return to capital follows the basic procedure of Feldstein, Poterba, and Dicks-Mireaux (1983), but several improvements have been made. More details are presented in Appendix A.

11. Recall that all variables in column 2 through 9 refer to 1 year earlier; thus the real net return reached 0.054 in 1984.

12. Note that comparing 1985 with 1979–81 shows a similar result. The investment–GNP ratio rose 0.8 percentage points while the equation predicts a rise of 1.0 percentage points.

13. The 5.3 percentage point decline and the estimated investment sensitivity of 0.02 together imply a decline of 0.1 percentage points in the investment–GNP ratio.

14. The projected increases in inflation are taken from Feldstein (1986) and are only available from 1960. The projected increases in inflation were calculated by estimating a first-order autoregressive moving average process, using it to project annual inflation for 10 future years, and then taking an average of those inflation rates.

15. This series of effective tax rates on interest income is presented in table 4.6 (see Appendix A).

16. On the case for studying such a simple model and for examining several alternative models rather than looking for the "true" model, see Feldstein (1982).

17. The maximum potential net return was introduced in Feldstein and Summers (1978) and used in Feldstein (1982) to explain investment behavior. A more formal description of the maximum potential net return is presented in section 4.4.

18. Note that the maximum potential net return that a firm can afford to pay is independent of its debt-equity ratio. In contrast, the returns the firm can afford to pay on debt and equity capital separately depend very much on the debt-equity mix.

19. The evidence in Feldstein (1986) indicates that the rise in anticipated budget deficits was the primary reason for the increase in real medium-term interest rates between 1979–81 and 1984. In particular, there is no evidence that the increase in the MPRNR raised interest rates.

20. Note that if the project were financed by debt, the MPNR would be the interest rate net of the tax deduction. If there are no taxes, the MPNR is the traditional internal rate of return. The maximum potential real net return is obtained by subtracting the expected inflation rate from the nominal MPNR value. Annual values of MPNR and MPRNR are presented in table 4.8 (see Appendix B).

21. The method of doing this adjustment and the adjusted data are presented in Appendix B.

22. We have done some preliminary analysis with a variety of alternative marginal q-models and find that a specification of marginal -q based on the potential profitability of investment provides a better explanation of past investment experience than the method used by Summers (1981).

23. This debt series has been estimated for the nonfinancial corporate sector and the total corporate sector and will be discussed in Feldstein and Jun (1986).

24. Because of nonneutral tax rules, a change in the rate of inflation changes the ratio of the stock market value to the nominal replacement value of the underlying assets but, with a persistent constant rate of inflation, the nominal stock market value should rise at the same rate as the nominal value of the underlying assets. See Feldstein (1980).

25. These weights are individuals, 0.082; mutual savings banks, 0.055; life insurance companies, 0.255; commercial banks, 0.427; all others, 0.181.

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Comment Roger H. Gordon

The objective of the Feldstein and Jun paper is to estimate the effect the Reagan tax changes had on the rate of corporate investment and to forecast what effect currently proposed tax changes might have on future rates of corporate investment. To do this, they use 2 alternative models of corporate investment, first presented in Feldstein (1982),

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which they reestimate using more recent data and a slightly different construction of the variables.

Attempting to estimate the numerical size of the effect of these recent tax changes on corporate investment is no simple task. Both the 1981 and 1982 tax changes were complex pieces of legislation. Together, they accelerated dramatically the schedule of depreciation deductions for both structures and equipment, though they also reduced the basis for depreciation of equipment by 5%. These changes should by themselves have increased the incentive to invest. However, this legislation also reduced personal tax rates substantially. For a given market interest rate, this reduction would have increased the rate of return available on alternative assets, thereby discouraging corporate investment. In fact, nominal market interest rates rose considerably at about the same time while the inflation rate dropped, thereby further increasing the required rate of return on corporate investment. The problem of measuring the net effect of these various changes on corporate investment rates is further complicated by the presence of a major recession during this period.

In order to estimate the effect of these tax changes on the rate of investment, Feldstein and Jun use 2 alternative empirical models of corporate investment. Each model has its strengths and weaknesses, and I will discuss each in turn.

The story underlying the first model is that the growth rate of corporate capital should depend positively on the net rate of return available on new investment in corporate capital. This net rate of return on new investment is approximated by the net of tax net of depreciation rate of return recently earned on existing corporate capital. The effect of the tax law is therefore summarized by the average tax rate on existing capital. Use of the average tax rate rather than a calculated marginal tax rate has some clear advantages. There are many special provisions in the tax law, and in the recent tax legislation, which affect particular industries or particular types of capital, but which are not taken into account in any of the standard measures of the marginal tax rate on capital. These special provisions would show up in the average tax rate. In addition, the lack of full loss offset in the tax law would show up in the average tax rate but is normally ignored in measures of the marginal tax rate.

Use of the average tax rate also has clear disadvantages, however. Consider how the incentive effects of the recent tax legislation would show up in the model. In the first year that the new depreciation and tax credit provisions are available, the average tax rate should not be affected since it is based on data from the previous year. In subsequent years, the average tax rate clearly would be affected by the new legislation but in proportion to the amount of new investment undertaken.

Given the strong autocorrelation in the time pattern of investment, this leads to a simultaneity bias and an overestimate of the effect of the new tax provisions.

In addition, even if this simultaneity were controlled for, the effects of the tax changes on the average tax rate should not necessarily approximate well their effects on the marginal tax rate. Consider 2 examples. The original Treasury I tax reform proposal recommended that depreciation deductions be based on much longer lifetimes but also be indexed to inflation. The present value of these deductions, depending on the discount rate used, would be close to comparable to those allowed under existing law. Yet the average tax rate in the years immediately following the new legislation should rise since the depreciation deductions taken then would be smaller than under the previous law. As a second example, consider the effects of reducing the statutory corporate tax rate as proposed in the House bill. Such a reduction would lead to a clear rise in the net of tax return earned on existing capital but may have quite different effects on the incentive to invest in new capital.[1]

While this first model may not adequately capture the effects of the new depreciation and tax credit provisions, it makes no attempt at all to capture the effects of the cut in personal tax rates and the changes in market interest rates and inflation rates on the rate of return required by investors on new corporate investments. There is no reason to presume these effects are small, so it is hard to place confidence in the forecasts of a model that ignores them.

Their second model is in many ways much more interesting. In this model, they assume that the rate of net investment depends on the difference between the marginal after-tax rate of return available on new capital investments and the rate of return, net of corporate taxes, required by investors in the firm.[2] Here, they explicitly attempt to calculate the required rate of return and so should be able to capture the effects of personal tax rate changes and the effects of changes in market interest rates. In addition, in this second model they focus on the marginal tax rate rather than the average tax rate and thereby avoid the various problems with the average tax rate described above.

This approach, although it is closely analogous to that used by Hall and Jorgenson (1967), differs in two key respects. First, Feldstein and Jun go to much greater effort to measure the required rate of return.

1. For example, if new investment in equipment is subsidized, then a cut in the statutory corporate tax rate should discourage such investment.

2. In a closed economy, one would need to worry as well about the determinants of the amount of savings being divided between alternative investments. If the economy is open, however, focusing just on relative rates of return would be appropriate.

While Hall and Jorgenson (1967) assumed that the required rate of return was 10% in all years, Feldstein and Jun attempt to measure explicitly the rate of return required on both the debt and equity issued to finance new investment. Also, while Hall and Jorgenson assume that the marginal product of capital depends on the existing capital-output ratio in the economy, Feldstein and Jun assume that the pretax marginal product of corporate capital is fixed and focus on the effects of the tax law. This assumption of a fixed pretax marginal product may have important implications if the model is used to forecast the long-run effect of tax changes on investment. However, it has a key advantage in that the estimated effects of the tax law on investment are not tied directly in the estimation to the effects of output changes on investment, as in Hall and Jorgenson (1967).

There are a variety of questions that can be raised about their implementation of this model, however. They approximate the required rate of return on corporate investments by a weighted average of the rates of return required on bonds and on equity. The key difficulty is measuring the rate of return required on equity. In principle, this rate of return should equal the after-tax risk-free rate of return that equity holders can earn elsewhere, plus a suitable risk premium, divided by 1 minus the effective personal tax rate on the return to equity. The problem is that the required risk premium cannot be measured with any accuracy.[3] The simplest procedure would be to assume that this risk premium is constant during the sample period, so that any movements in the required rate of return on investment arise from movements in the after-tax interest rate. Feldstein and Jun in fact attempt this in section 4.2.1 and find that with this specification taxes no longer have much relation to the investment rate.

Given the difficulties in measuring the risk premium directly, Feldstein and Jun instead approximate the required rate of return on equity by the earnings-price ratio then prevailing for corporate equity. The earnings-price ratio certainly should include a risk premium in it. The trouble is that it also should include a variety of additional factors. For example, as discussed above, after-tax earnings are affected by the investment rate and so are endogenous to the model. In addition, stock prices are a very good indicator of market expectations of future profitability. When expectations are optimistic, prices are high and the earnings-price ratio therefore is low. This low value does not result from a low required rate of return on new investment, however, and the close association between the investment rate and the cost of capital therefore may result from extraneous factors. Much more work is needed

3. For a discussion of the problems, see Merton (1980).

to judge whether the statistical success of this second model relative to one assuming a fixed risk premium results from these various biases rather than from the inclusion of an implicit measure of the risk premium.

An additional problem with their measure of the required rate of return is that they assume a fixed debt-equity ratio when constructing this measure rather than using the prevailing debt-equity ratio. To see how this can be a problem, consider a change in a firm's debt-equity ratio in a setting without taxes or bankruptcy. In this setting, an increase in a firm's debt-equity ratio means that the risk in the return to corporate capital is divided among fewer shares of equity, making each share riskier. Given the assumptions, the required return on corporate capital should not change, even though the observed earnings-price ratio would have increased. However, Feldstein and Jun would estimate an increase in the required rate of return. Therefore, they would overestimate the required return during periods when debt-equity ratios are high, as in the 1970s, which was also a period when investment rates were low.

I also have a few questions about the procedure they use to calculate the rate of return that could be earned on new corporate investment. To begin with, they implicitly calculate the present value of depreciation deductions allowed by the tax law using as a discount rate the calculated nominal rate of return on new corporate investment. However, the stream of income from depreciation deductions has essentially no nominal risk and so ought to be discounted at the rate of return available to the corporation on nominally risk-free investments—the after-corporate-tax interest rate. With this change, the estimated available rate of return on corporate investments should be much less sensitive to changes in the depreciation schedule in the tax law, and it should also be less sensitive to changes in the inflation rate.

The final part of the paper I would like to discuss is the procedure they use to forecast the effects of recently proposed tax changes. In forecasting the effects of enacting the Administration's proposals or enacting the House bill, Feldstein and Jun assume that the required rate of return would be unaffected. However, there are a variety of reasons to expect that this required rate of return would increase as a result of these tax changes. To begin with, the drop in personal tax rates should lead to an increase in the rate of return that equity holders can get elsewhere and so an increase in the rate of return that they would require on new equity investments. In addition, the proposed drop in the corporate tax rate implies that a larger fraction of the random fluctuations in the return to corporate investments would be borne by equity holders rather than passed on to the government. Since equity holders would be bearing a larger fraction of the risk, the risk premium per dollar invested ought to increase, again raising the required rate of return on new investments. Taking into account these increases in the required rate of return would strengthen Feldstein's and Jun's forecast that these tax changes would reduce the rate of corporate investment.

One further problem in forecasting the effects of tax changes on future investment rates is taking into account market expectations of future changes in the tax law. As Lucas (1976) argued, if tax changes are viewed to be temporary, the investment rate should react much more quickly to tax changes.[4] Forecasting the long-run changes in the capital stock based on observed or estimated short-run responses is very difficult. Since these long-run effects are of much more interest for tax analysis than the size of the short-run response, these complications cannot be avoided.

In summary, Feldstein and Jun have provided intriguing and dramatic evidence on the possible effects of recent and proposed tax changes on the rate of corporate investment. However, it seems premature to conclude anything with confidence about the empirical size of the effects of these tax changes on the rate of investment.

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4. For estimates of the effects of these expectations on effective tax rates, see Auerbach and Hines (1986).